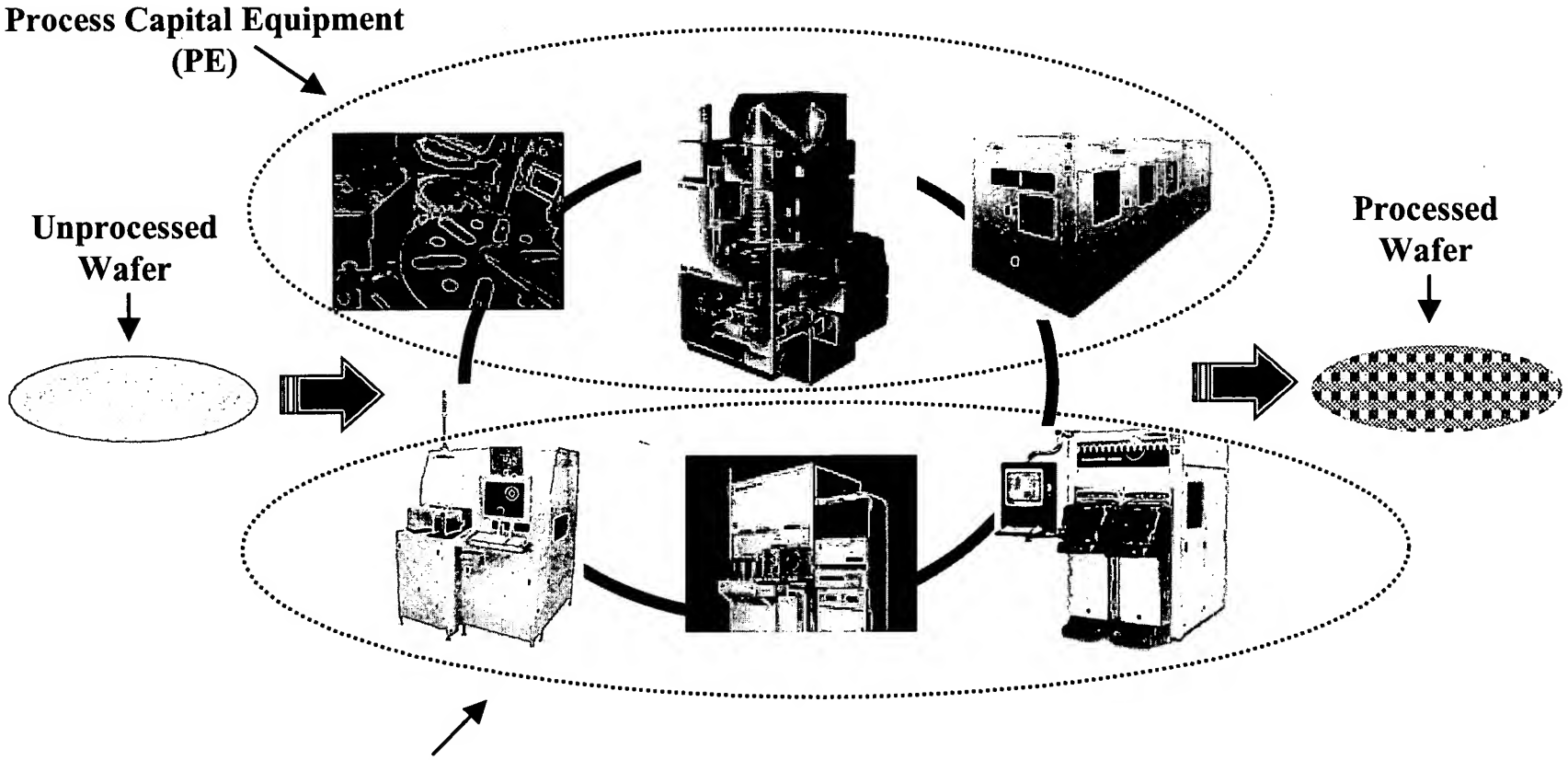

Process Capital Equipment
(PE)
Unprocessed
Wafer
Processed
Wafer
Monitoring Capital Equipment

FIGURE 1

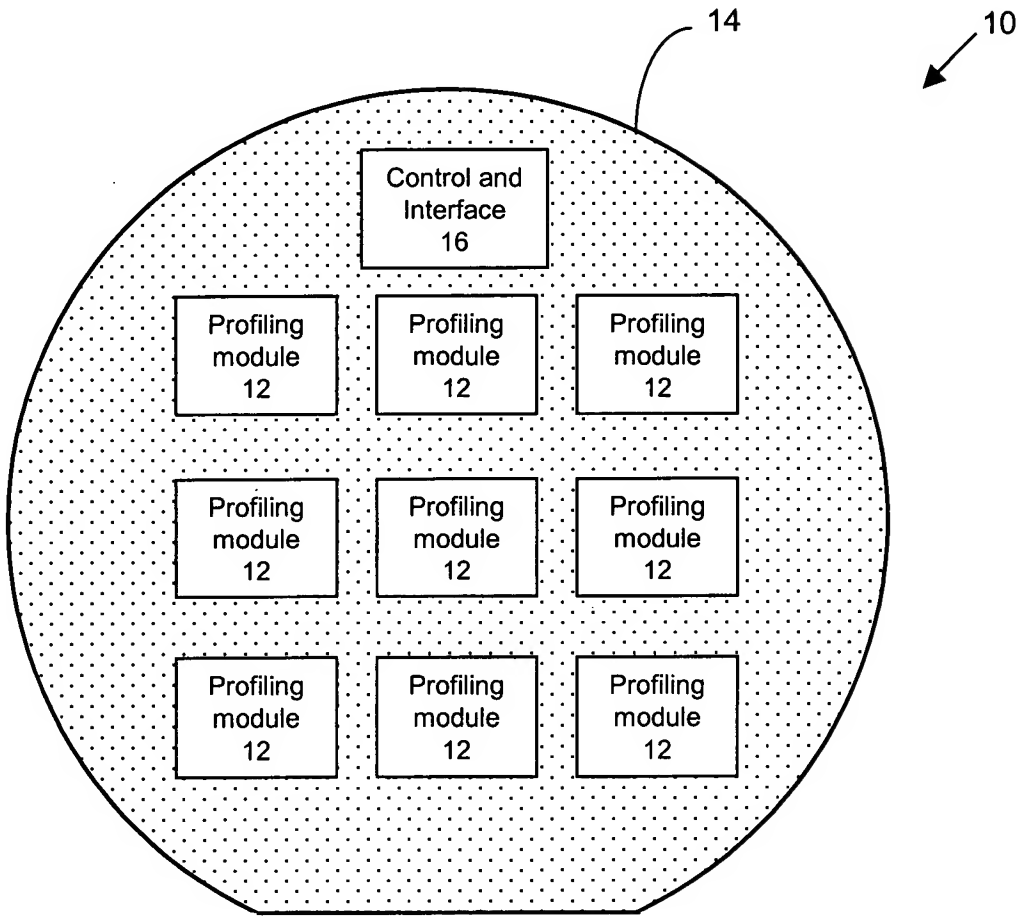

14
10
Control and Interface 16
Profiling module 12
Profiling module 12
Profiling module 12
Profiling module 12
Profiling module 12
Profiling module 12
Profiling module 12
Profiling module 12
Profiling module 12

FIGURE 2

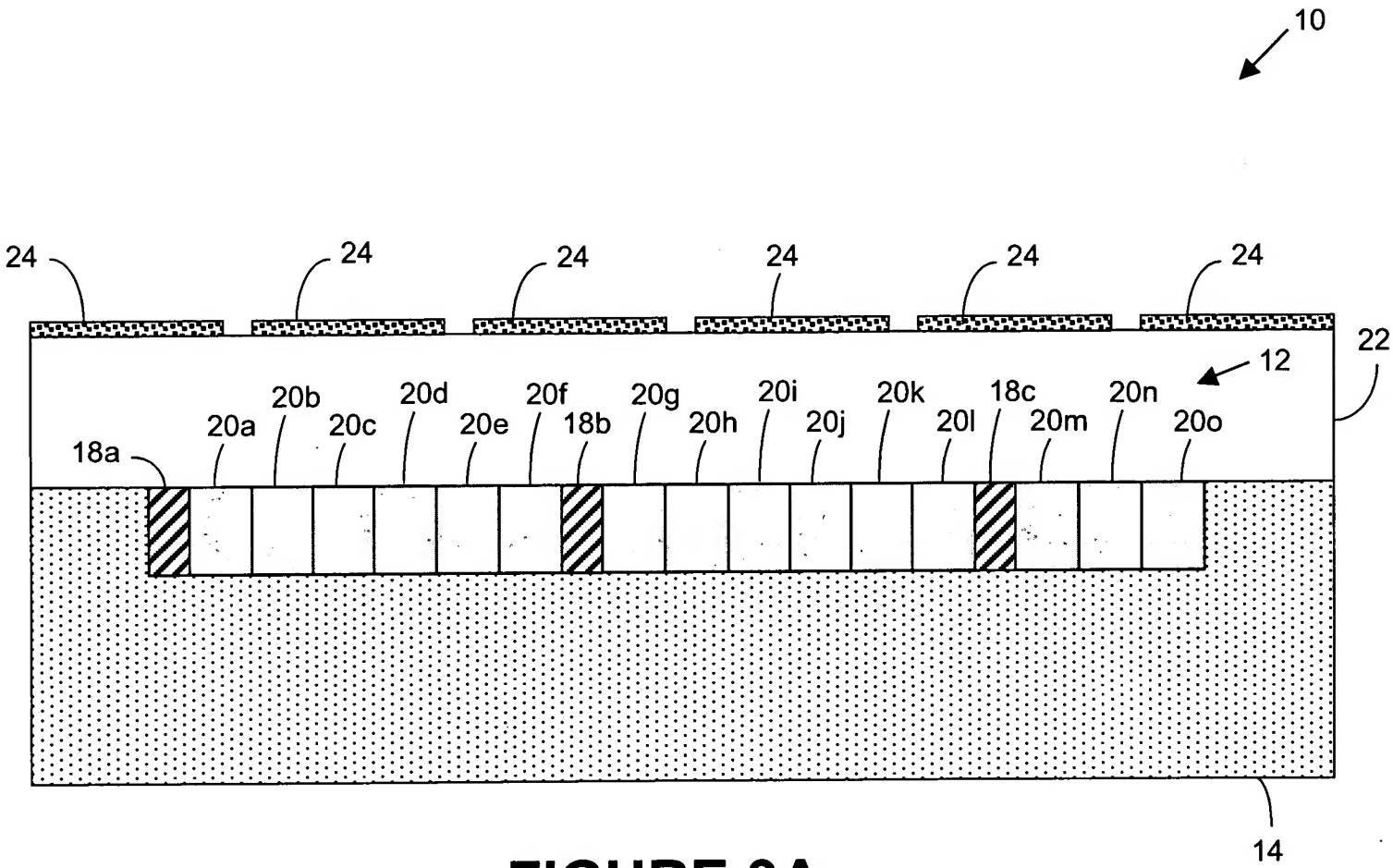

10
24
24
24
24
24
24
22
12
18a
20a
20b
20c
20d
20e
20f
18b
20g
20h
20i
20j
20k
20l
18c
20m
20n
20o
14

FIGURE 3A

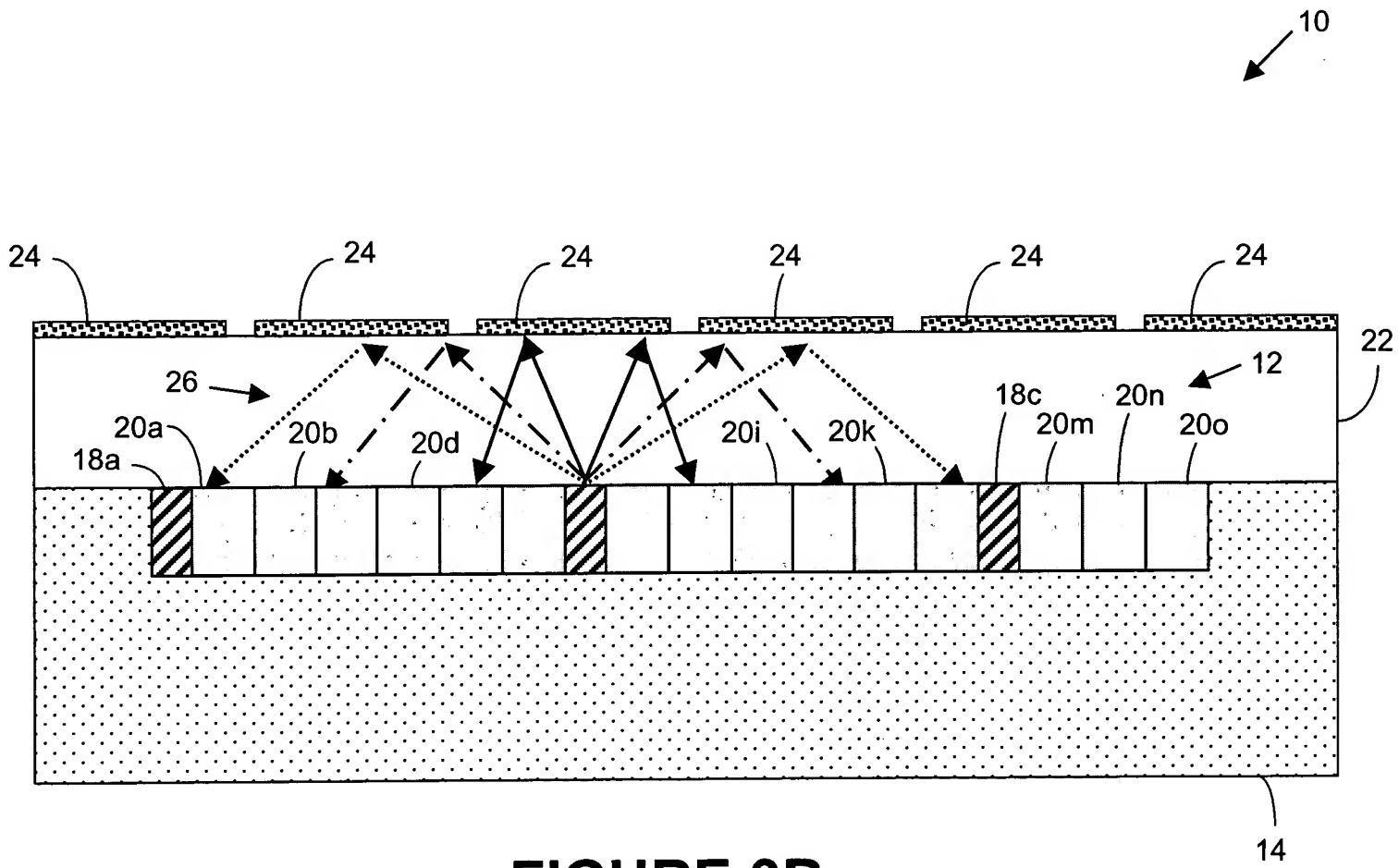

10
24
24
24
24
24
24
22
12
26
18c
20n
20m
20o
20a
20b
20d
20i
20k
18a
14

FIGURE 3B

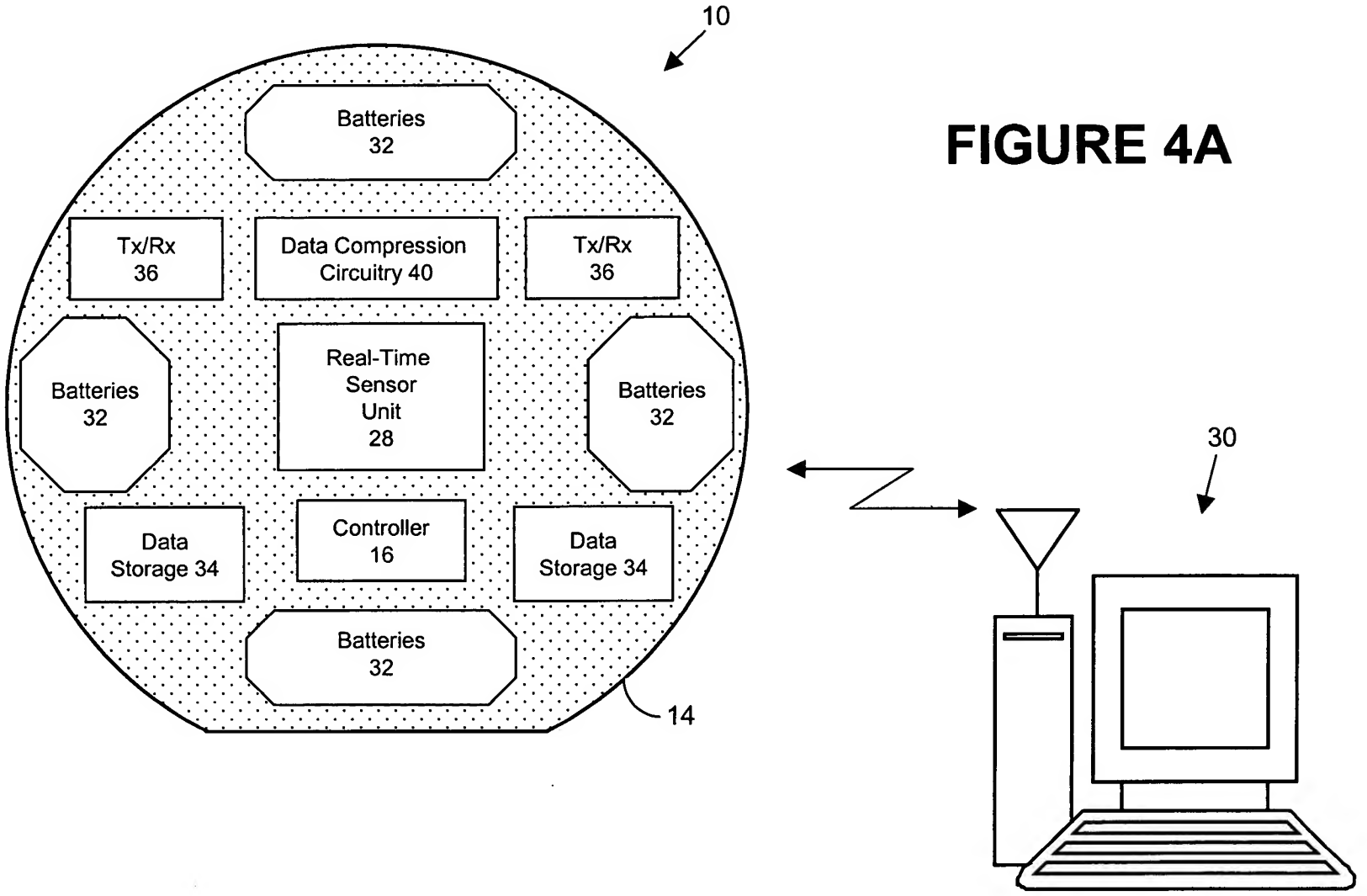

10
Batteries
32
Tx/Rx
36
Data Compression
Circuitry 40
Tx/Rx
36
Batteries
32
Real-Time
Sensor
Unit
28
Batteries
32
Data
Storage 34
Controller
16
Data
Storage 34
Batteries
32
14
30

FIGURE 4A

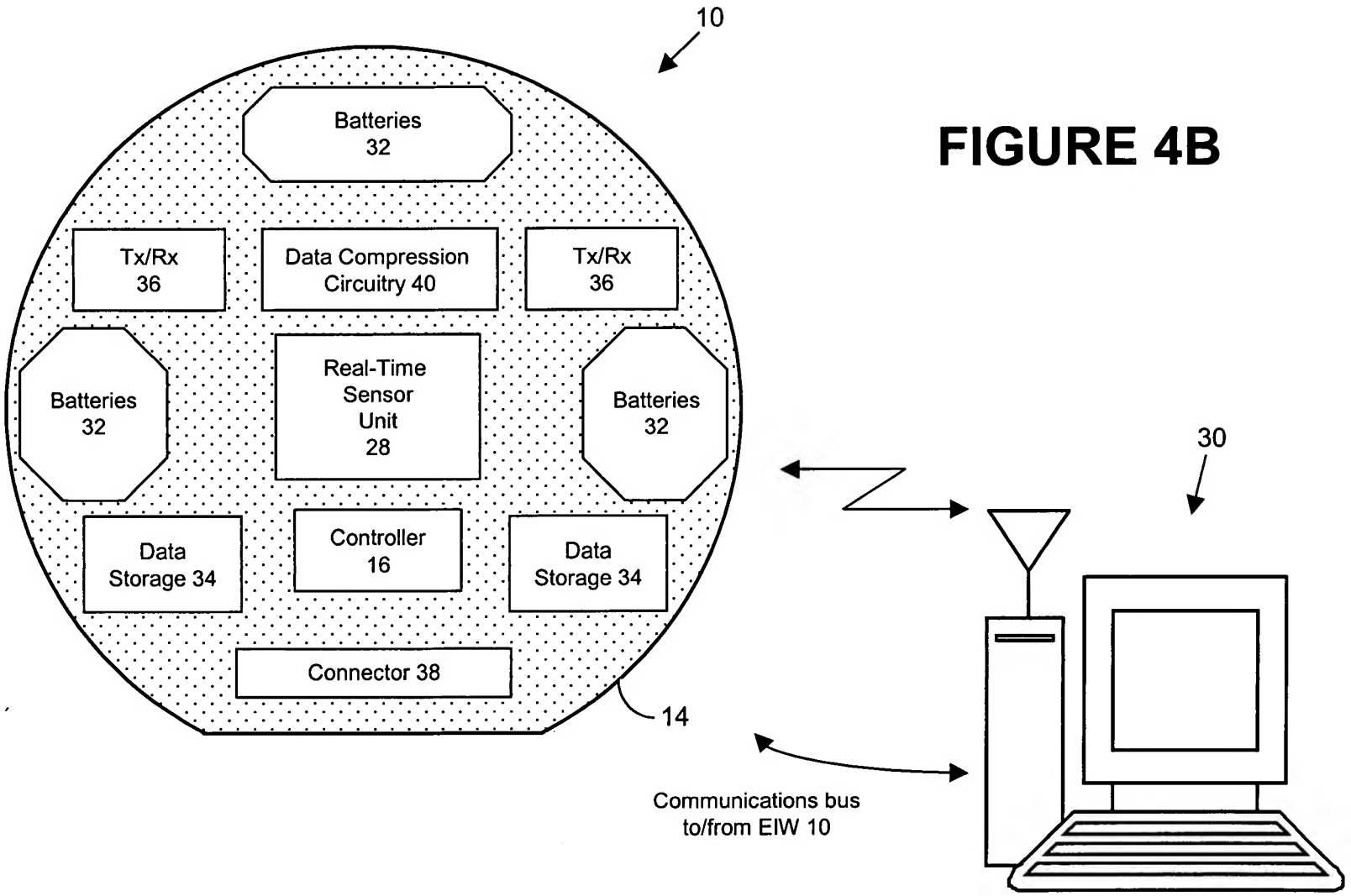

10
Batteries
32
Tx/Rx
36
Data Compression
Circuitry 40
Tx/Rx
36
Batteries
32
Real-Time
Sensor
Unit
28
Batteries
32
Data
Storage 34
Controller
16
Data
Storage 34
Connector 38
14
30
Communications bus
to/from EIW 10

FIGURE 4B

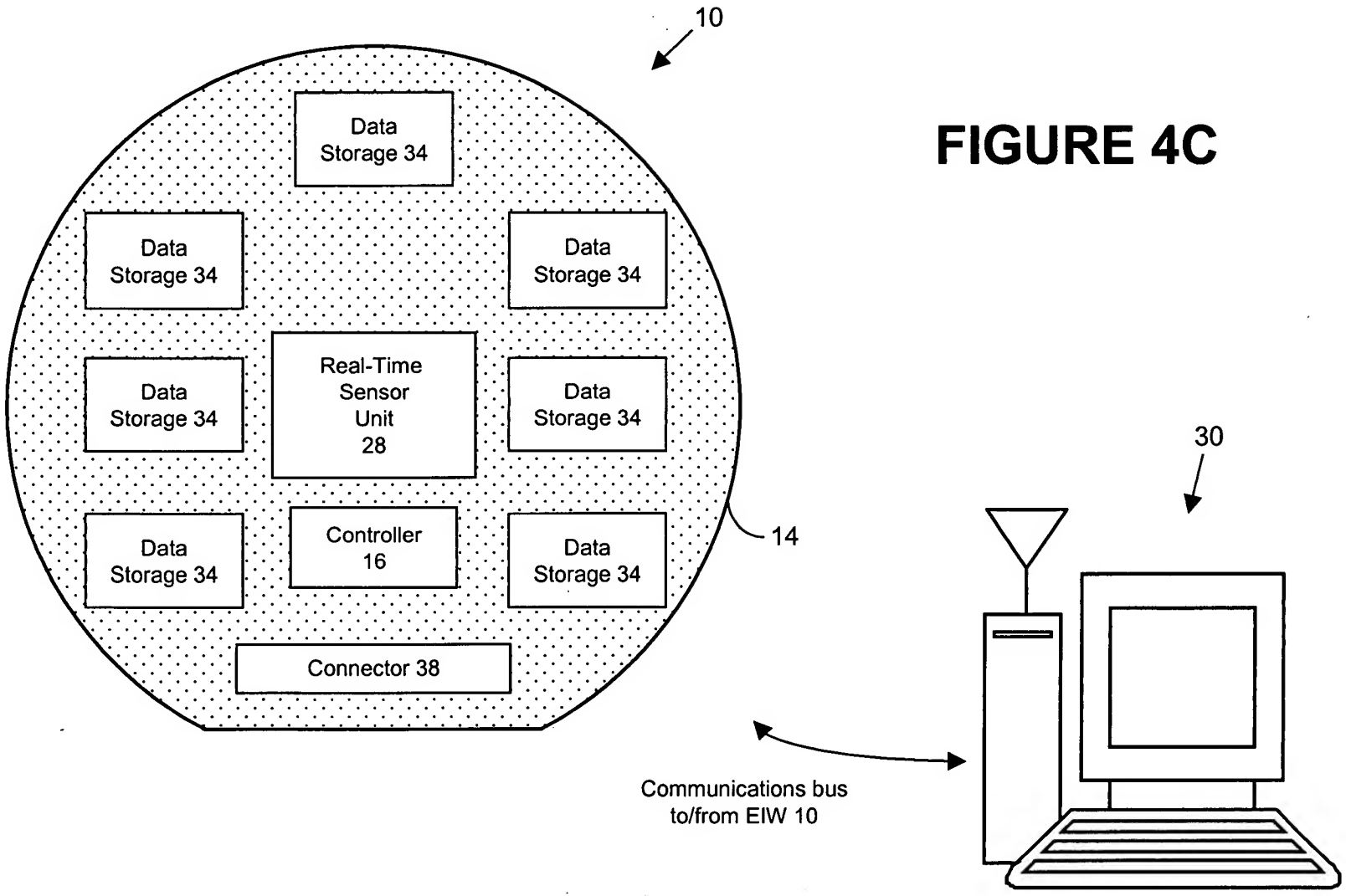

10
Data Storage 34
Data Storage 34
Data Storage 34
Real-Time Sensor Unit 28
Data Storage 34
Data Storage 34
Controller 16
Data Storage 34
Connector 38
14
30
Communications bus to/from EIW 10

FIGURE 4C

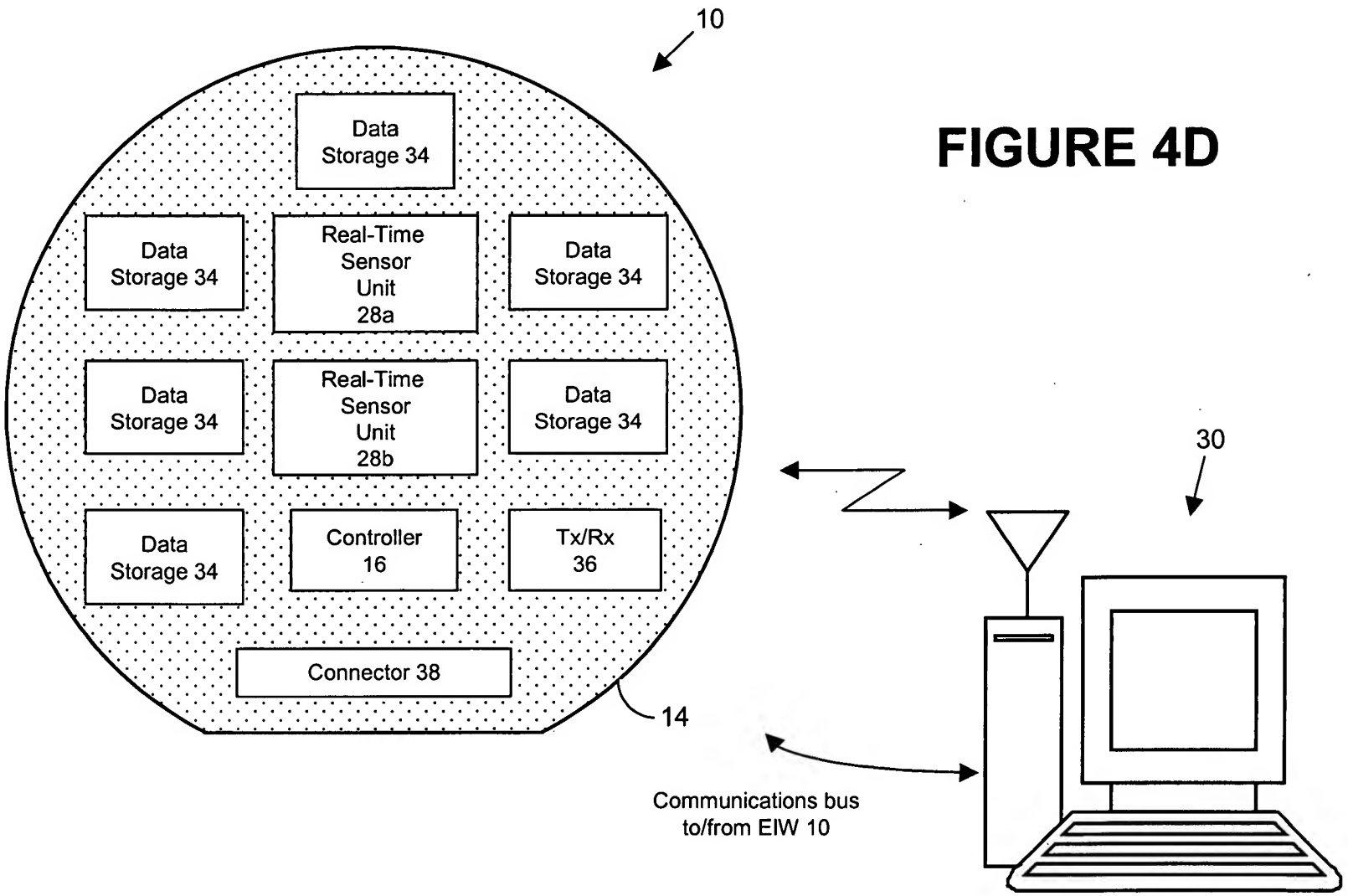

10
Data Storage 34
Data Storage 34
Real-Time Sensor Unit 28a
Data Storage 34
Data Storage 34
Real-Time Sensor Unit 28b
Data Storage 34
Data Storage 34
Controller 16
Tx/Rx 36
Connector 38
14
30
Communications bus to/from EIW 10

FIGURE 4D

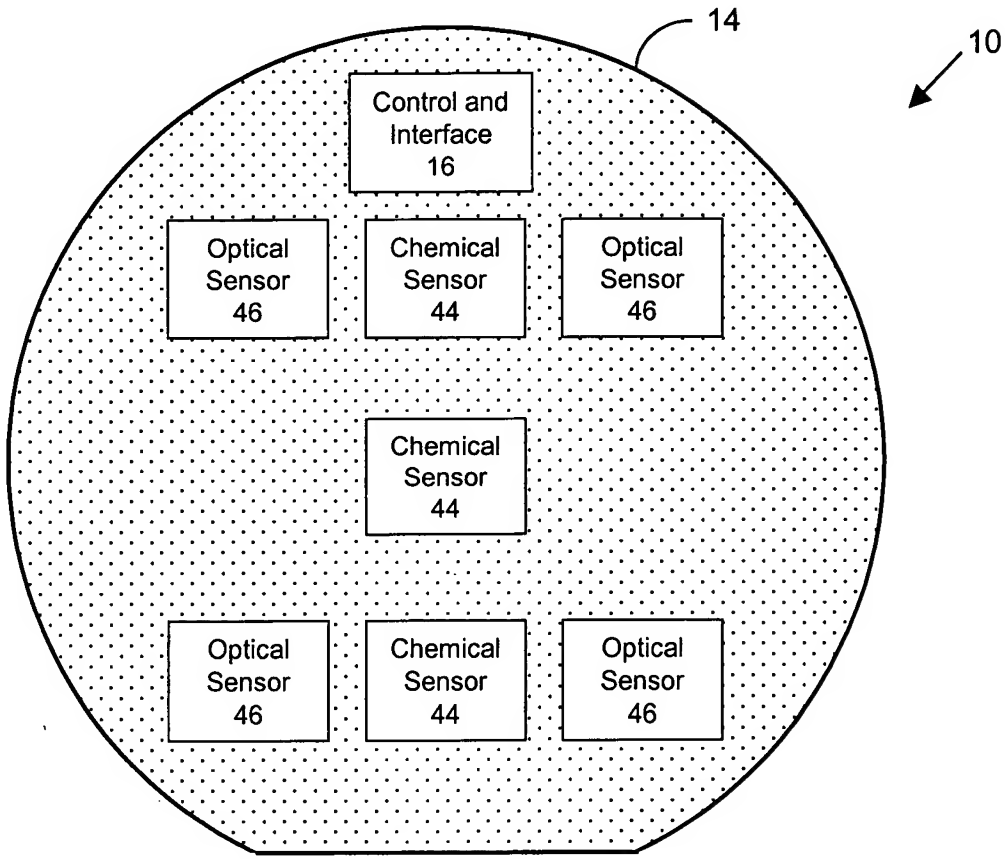

14
10
Control and Interface 16
Optical Sensor 46
Chemical Sensor 44
Optical Sensor 46
Chemical Sensor 44
Optical Sensor 46
Chemical Sensor 44
Optical Sensor 46

FIGURE 5A

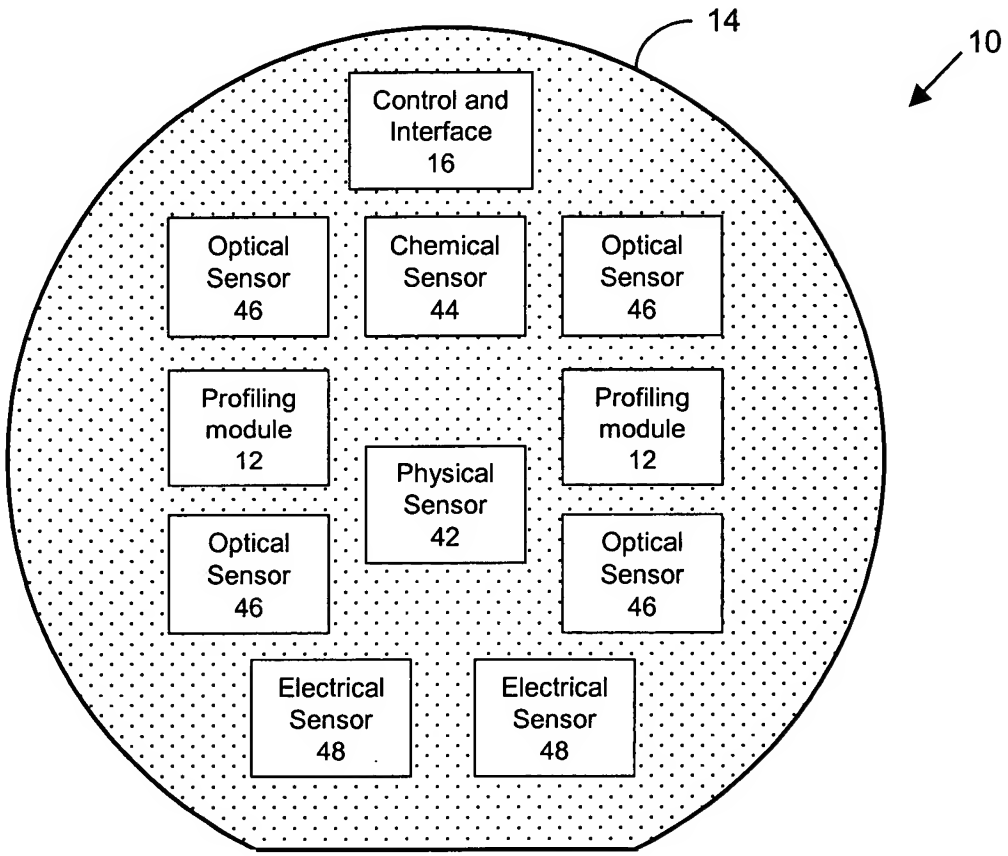

14
10
Control and Interface 16
Optical Sensor 46
Chemical Sensor 44
Optical Sensor 46
Profiling module 12
Physical Sensor 42
Profiling module 12
Optical Sensor 46
Optical Sensor 46
Electrical Sensor 48
Electrical Sensor 48

FIGURE 5B

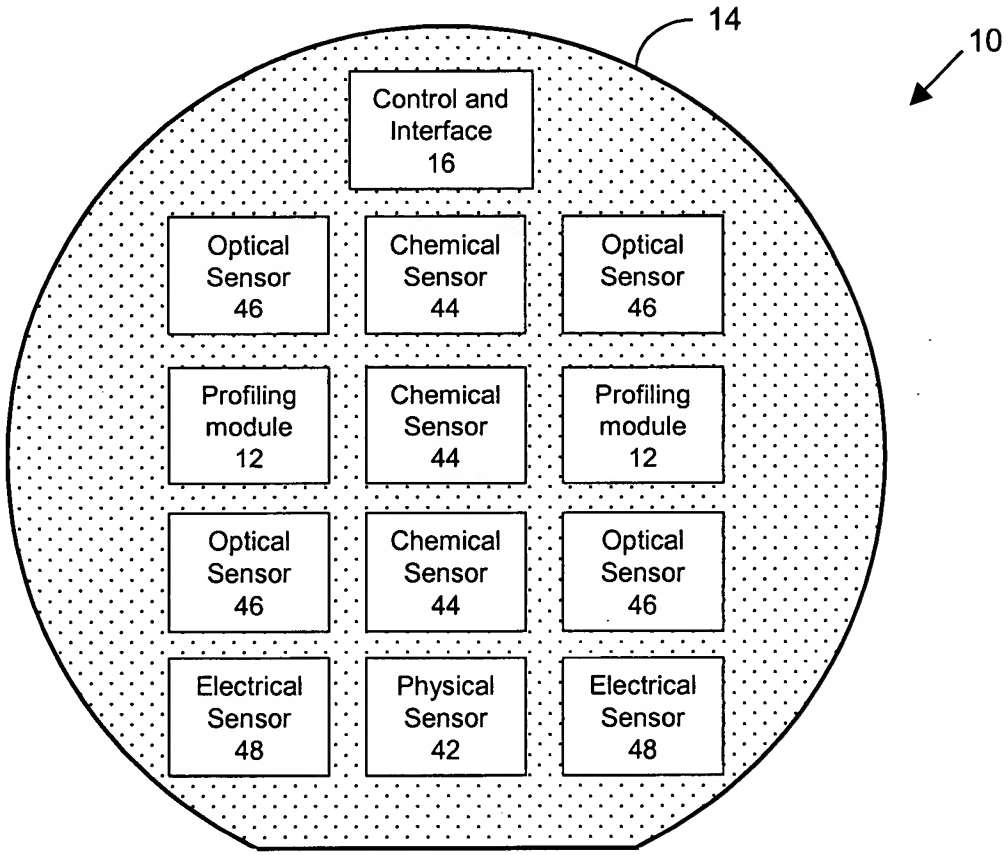

14
10
Control and Interface 16
Optical Sensor 46
Chemical Sensor 44
Optical Sensor 46
Profiling module 12
Chemical Sensor 44
Profiling module 12
Optical Sensor 46
Chemical Sensor 44
Optical Sensor 46
Electrical Sensor 48
Physical Sensor 42
Electrical Sensor 48

FIGURE 5C

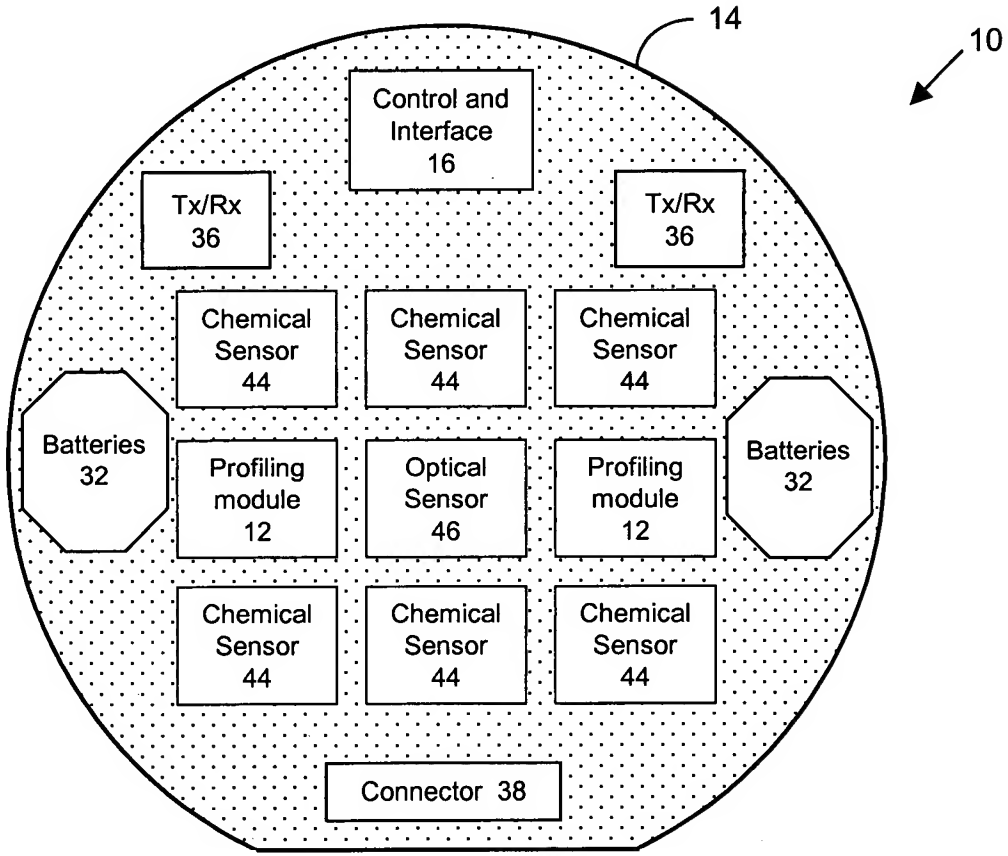

14
10
Control and Interface 16
Tx/Rx 36
Tx/Rx 36
Chemical Sensor 44
Chemical Sensor 44
Chemical Sensor 44
Batteries 32
Profiling module 12
Optical Sensor 46
Profiling module 12
Batteries 32
Chemical Sensor 44
Chemical Sensor 44
Chemical Sensor 44
Connector 38

FIGURE 5D

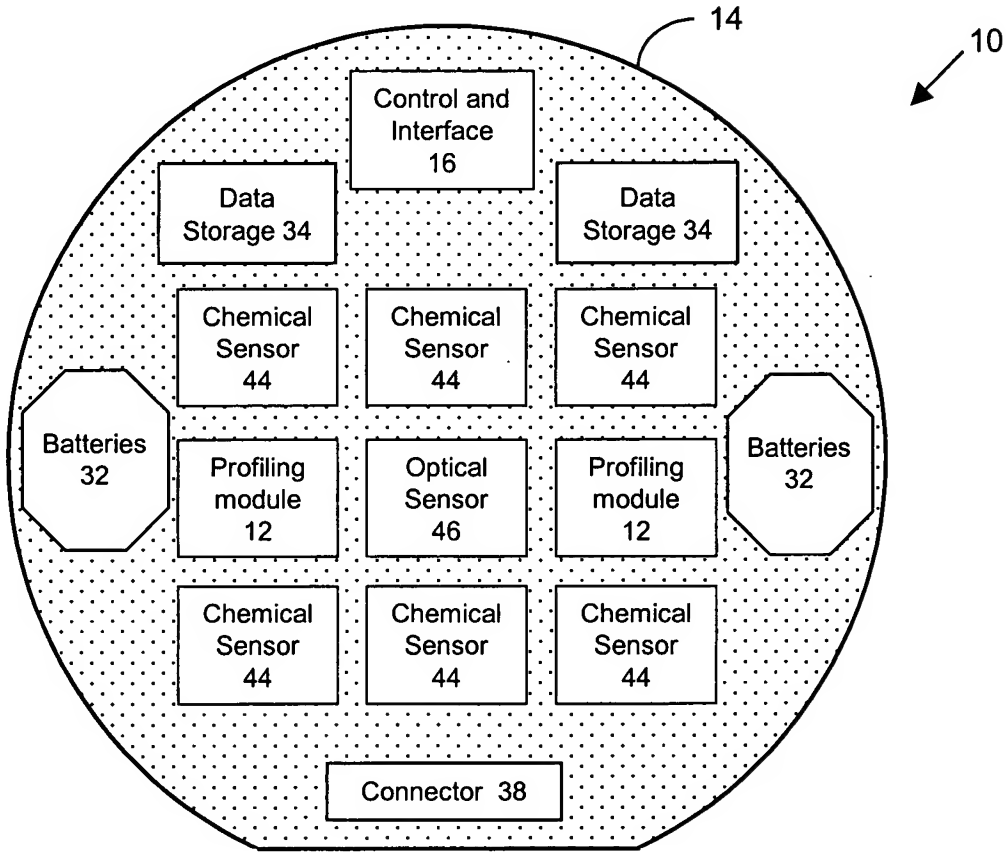

14
10
Control and Interface 16
Data Storage 34
Data Storage 34
Chemical Sensor 44
Chemical Sensor 44
Chemical Sensor 44
Batteries 32
Profiling module 12
Optical Sensor 46
Profiling module 12
Batteries 32
Chemical Sensor 44
Chemical Sensor 44
Chemical Sensor 44
Connector 38

FIGURE 5E

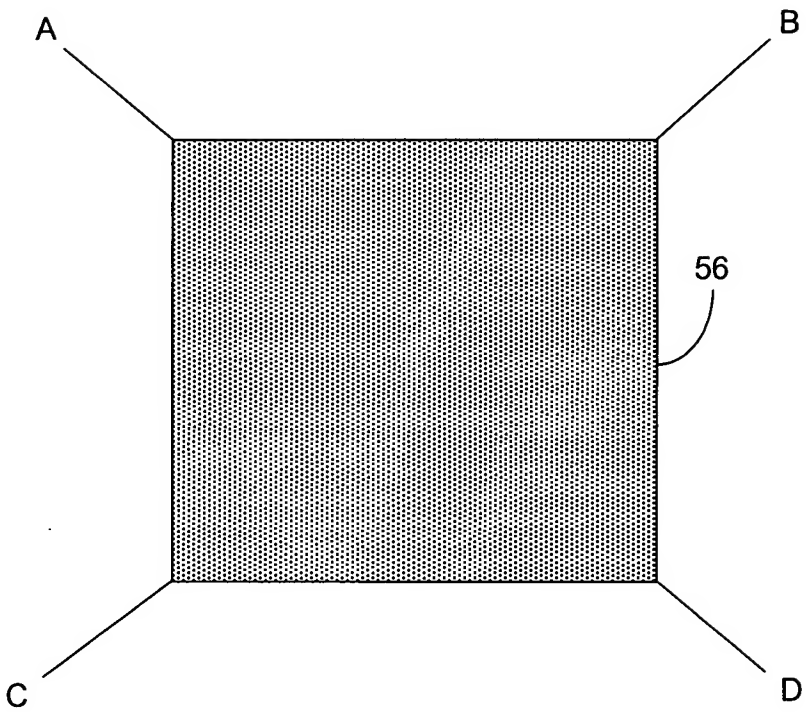


FIGURE 6

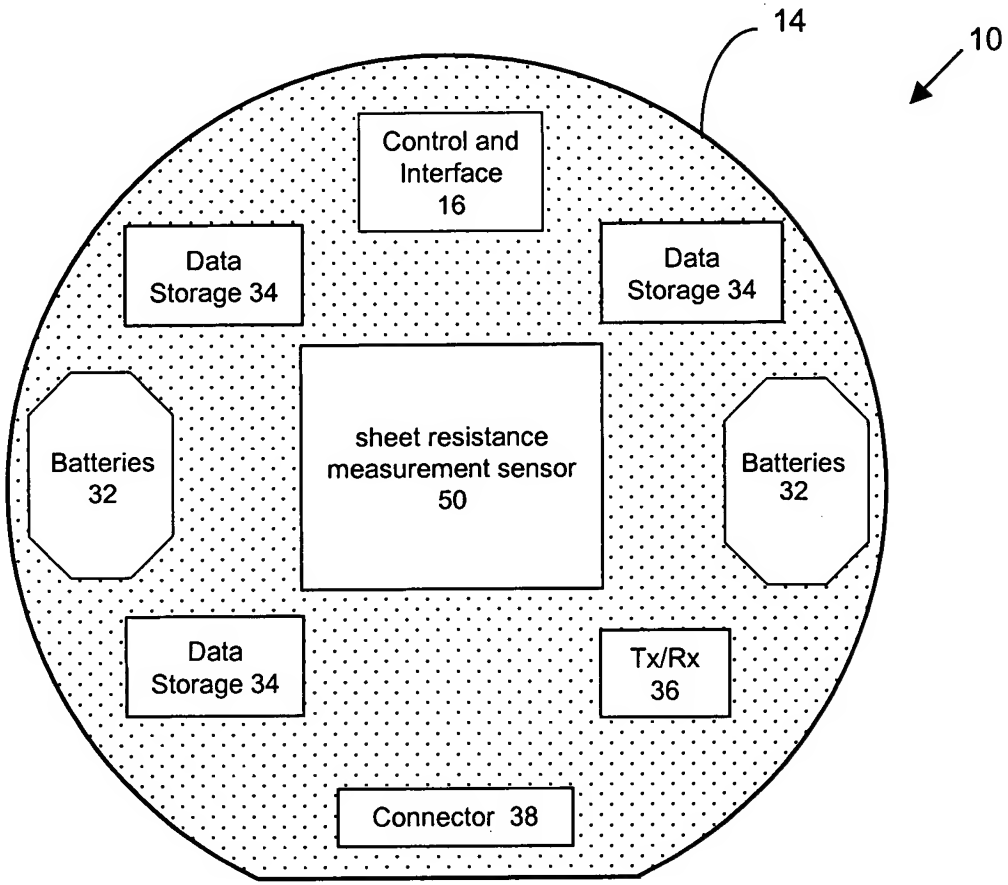

14
10
Control and Interface 16
Data Storage 34
Data Storage 34
Batteries 32
sheet resistance measurement sensor 50
Batteries 32
Data Storage 34
Tx/Rx 36
Connector 38

FIGURE 7A

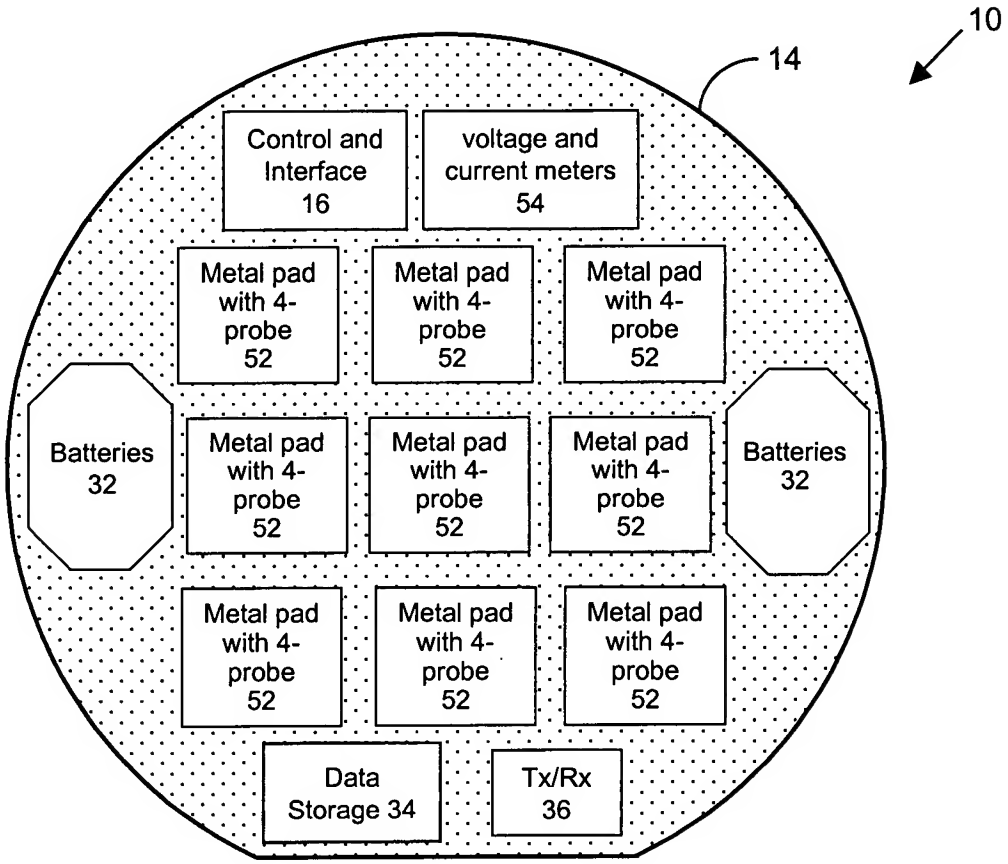

10
14
Control and Interface 16
voltage and current meters 54
Metal pad with 4-probe 52
Metal pad with 4-probe 52
Metal pad with 4-probe 52
Batteries 32
Metal pad with 4-probe 52
Metal pad with 4-probe 52
Metal pad with 4-probe 52
Batteries 32
Metal pad with 4-probe 52
Metal pad with 4-probe 52
Metal pad with 4-probe 52
Data Storage 34
Tx/Rx 36

FIGURE 7B

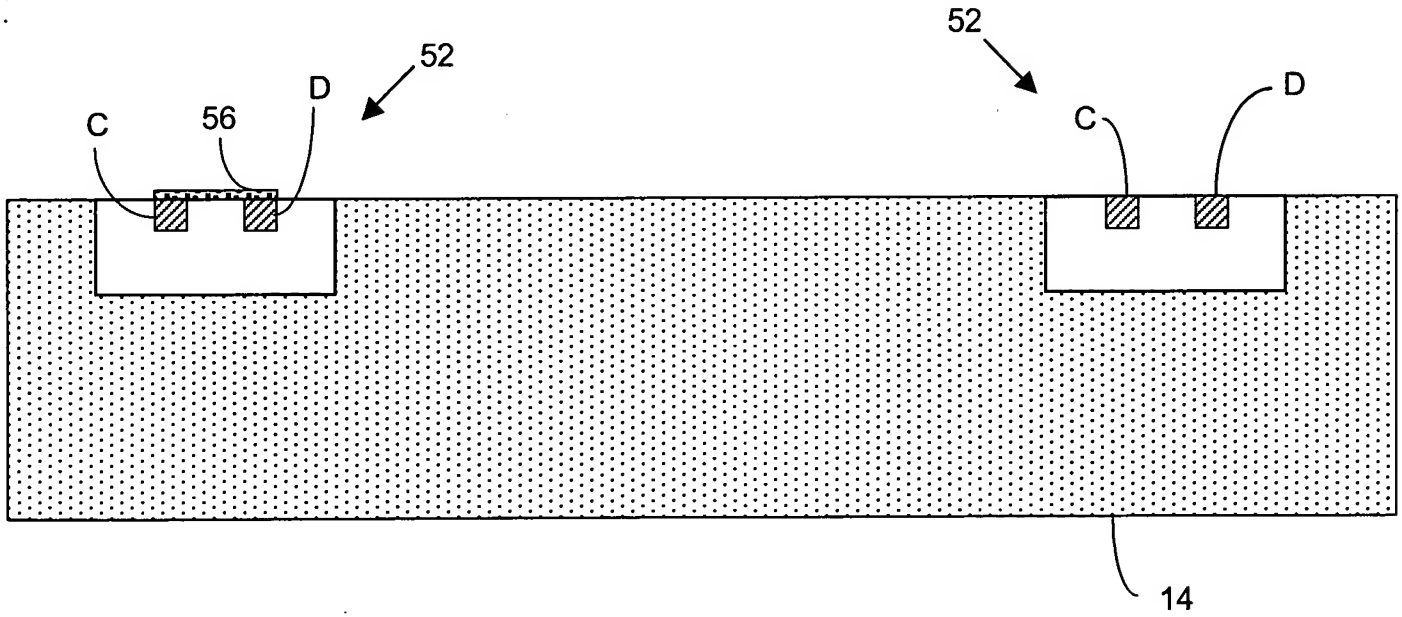


FIGURE 8

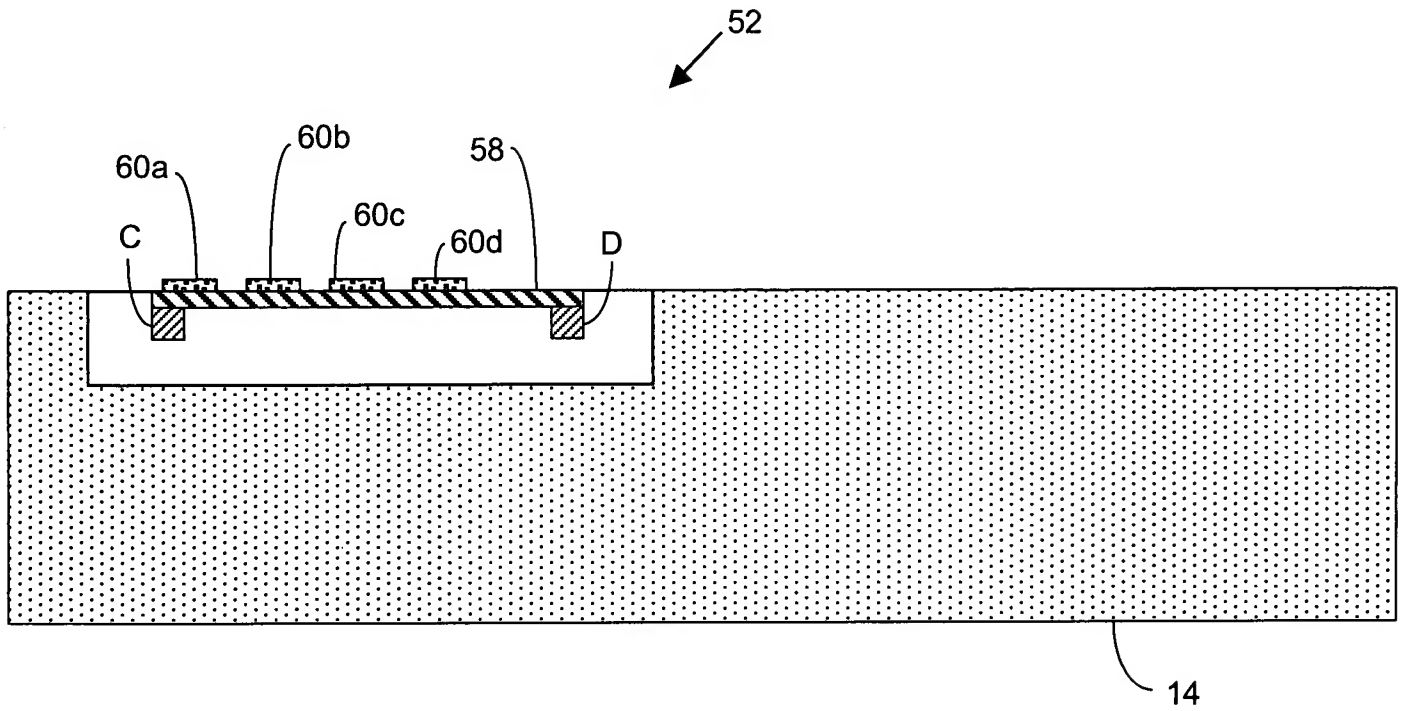


FIGURE 9

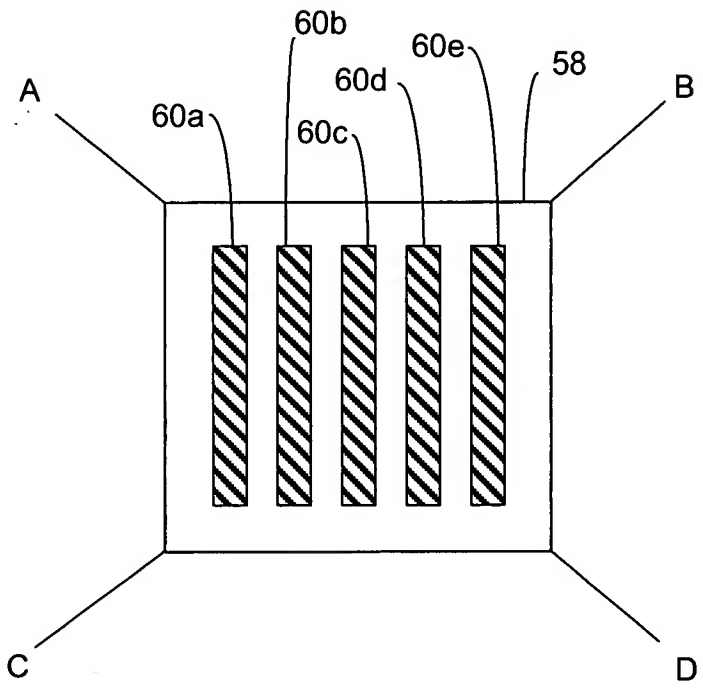


FIGURE 10A

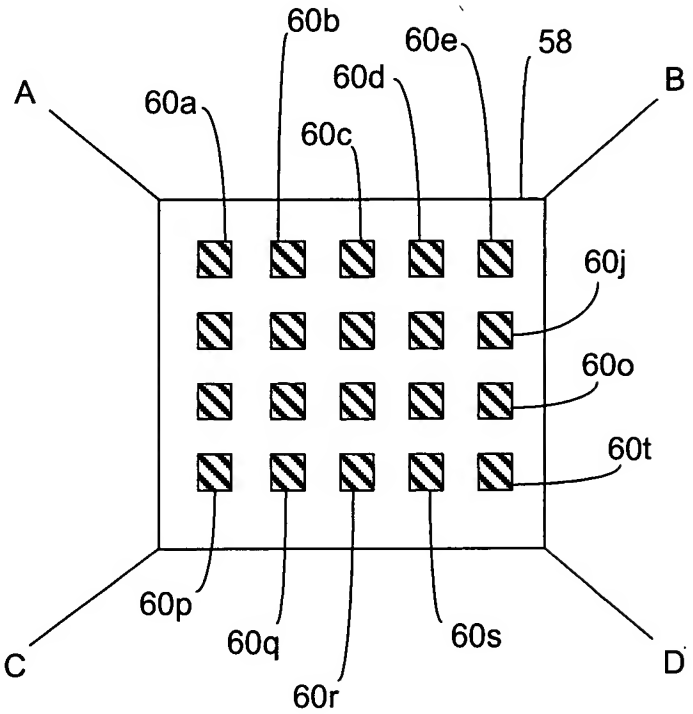


FIGURE 10B

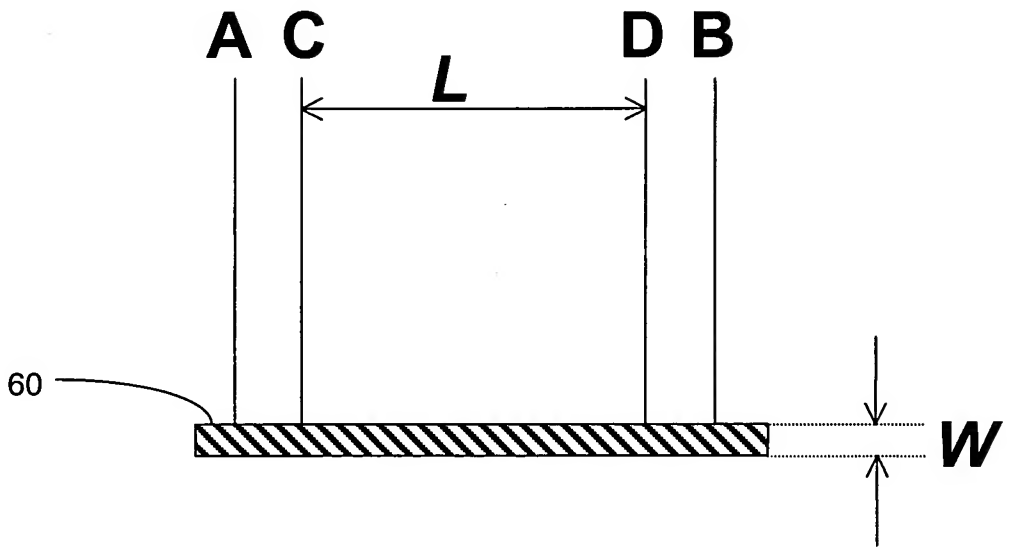


FIGURE 11

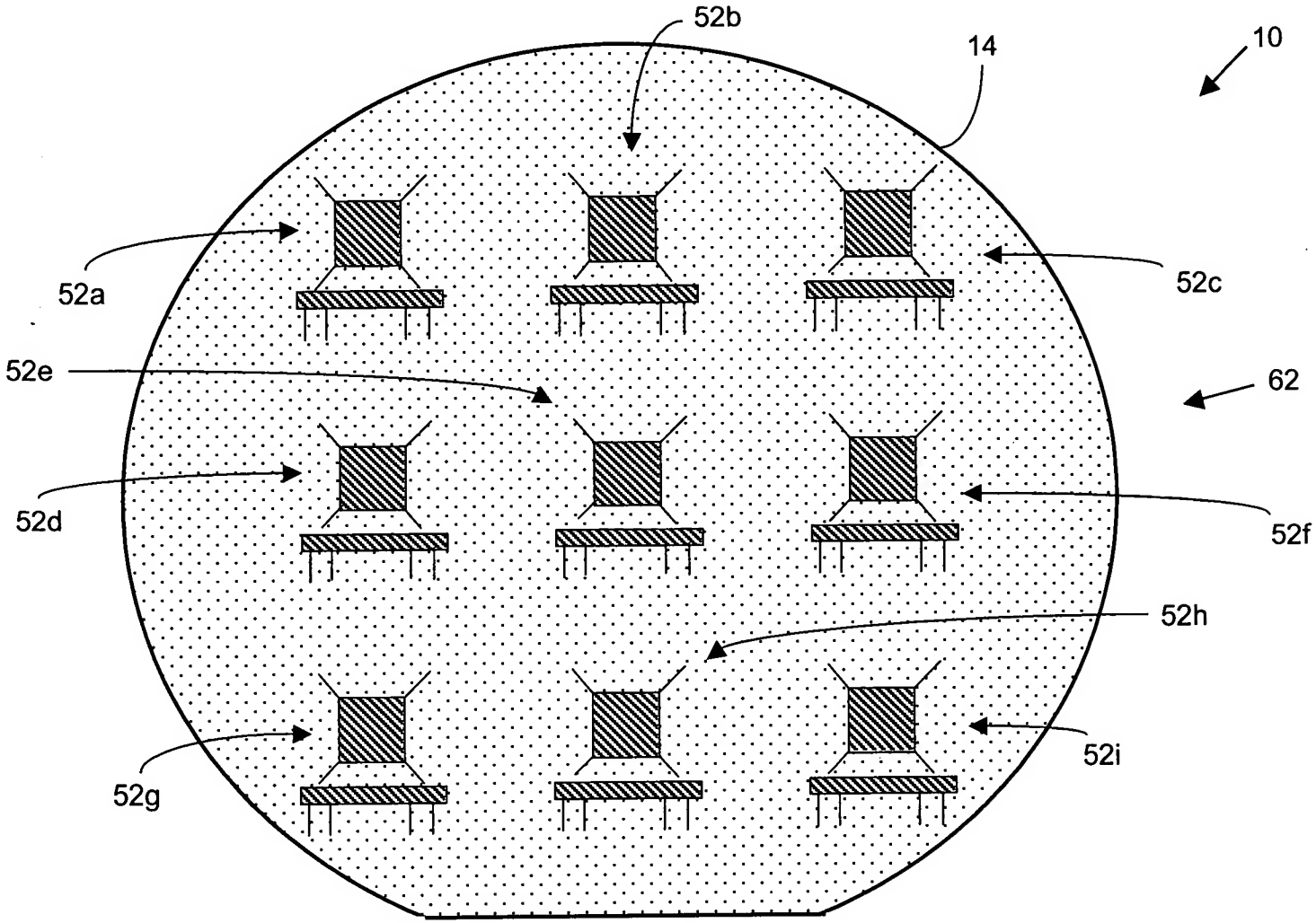


FIGURE 12

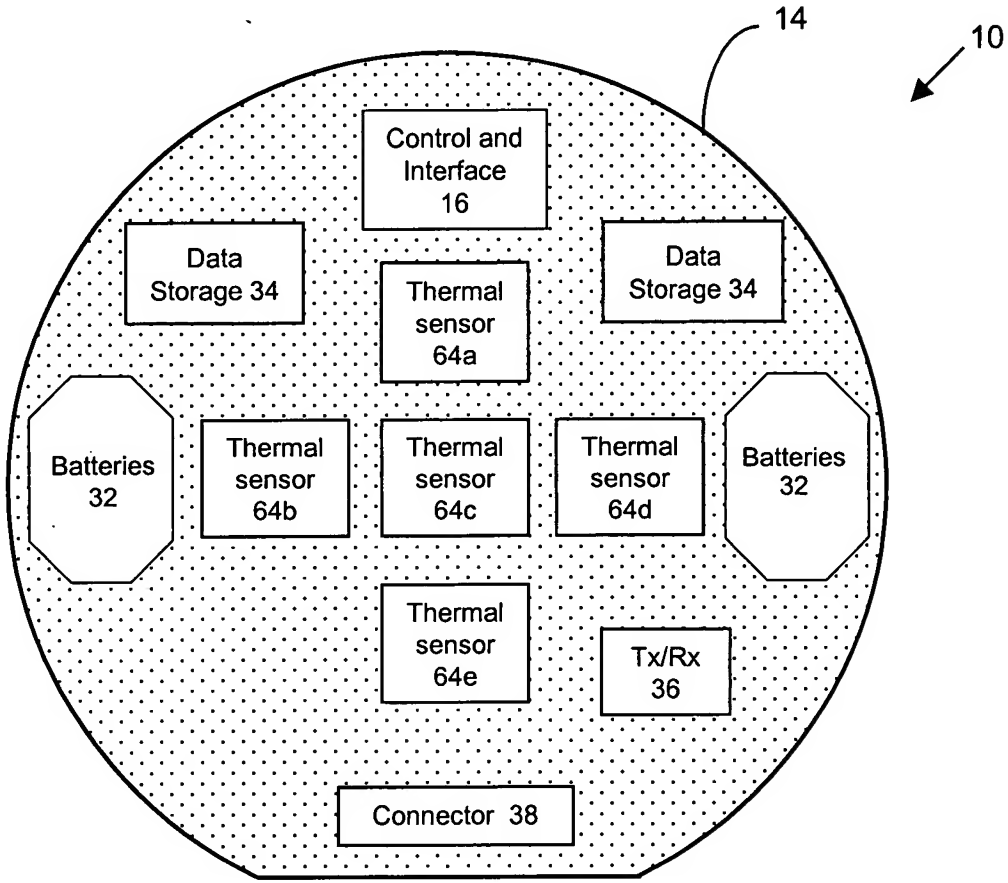

14
10
Control and Interface 16
Data Storage 34
Thermal sensor 64a
Data Storage 34
Batteries 32
Thermal sensor 64b
Thermal sensor 64c
Thermal sensor 64d
Batteries 32
Thermal sensor 64e
Tx/Rx 36
Connector 38

FIGURE 13A

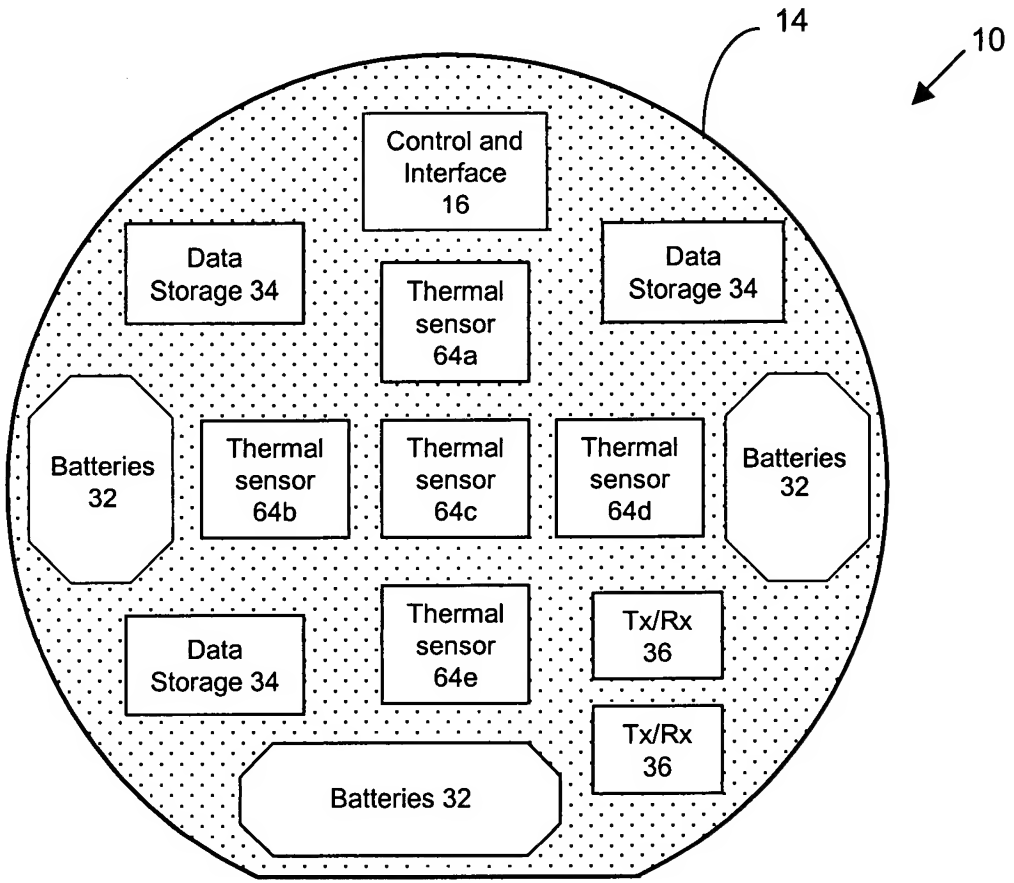

14
10
Control and Interface 16
Data Storage 34
Thermal sensor 64a
Data Storage 34
Batteries 32
Thermal sensor 64b
Thermal sensor 64c
Thermal sensor 64d
Batteries 32
Data Storage 34
Thermal sensor 64e
Tx/Rx 36
Tx/Rx 36
Batteries 32

FIGURE 13B

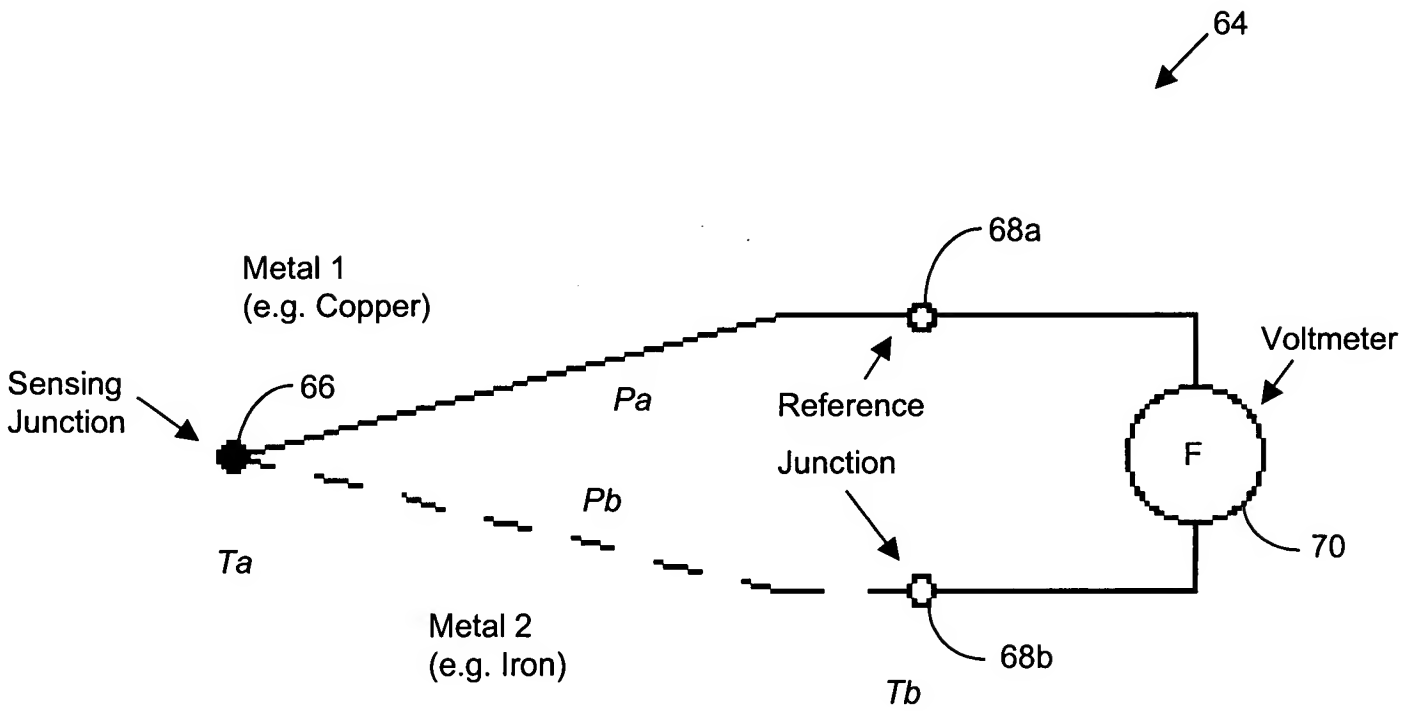

64
68a
Metal 1
(e.g. Copper)
Voltmeter
Sensing
Junction
66
Pa
Reference
Junction
F
Pb
70
Ta
Metal 2
(e.g. Iron)
68b
Tb

FIGURE 14

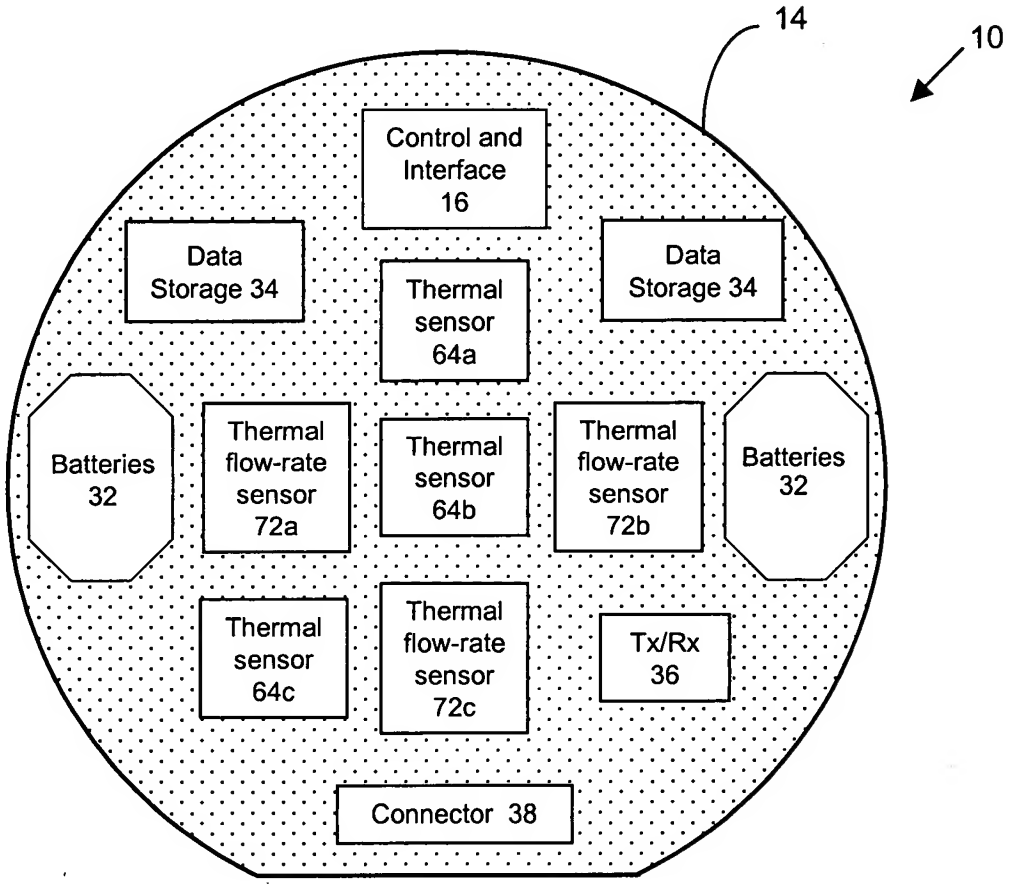

14
10
Control and Interface 16
Data Storage 34
Thermal sensor 64a
Data Storage 34
Batteries 32
Thermal flow-rate sensor 72a
Thermal sensor 64b
Thermal flow-rate sensor 72b
Batteries 32
Thermal sensor 64c
Thermal flow-rate sensor 72c
Tx/Rx 36
Connector 38

FIGURE 15A

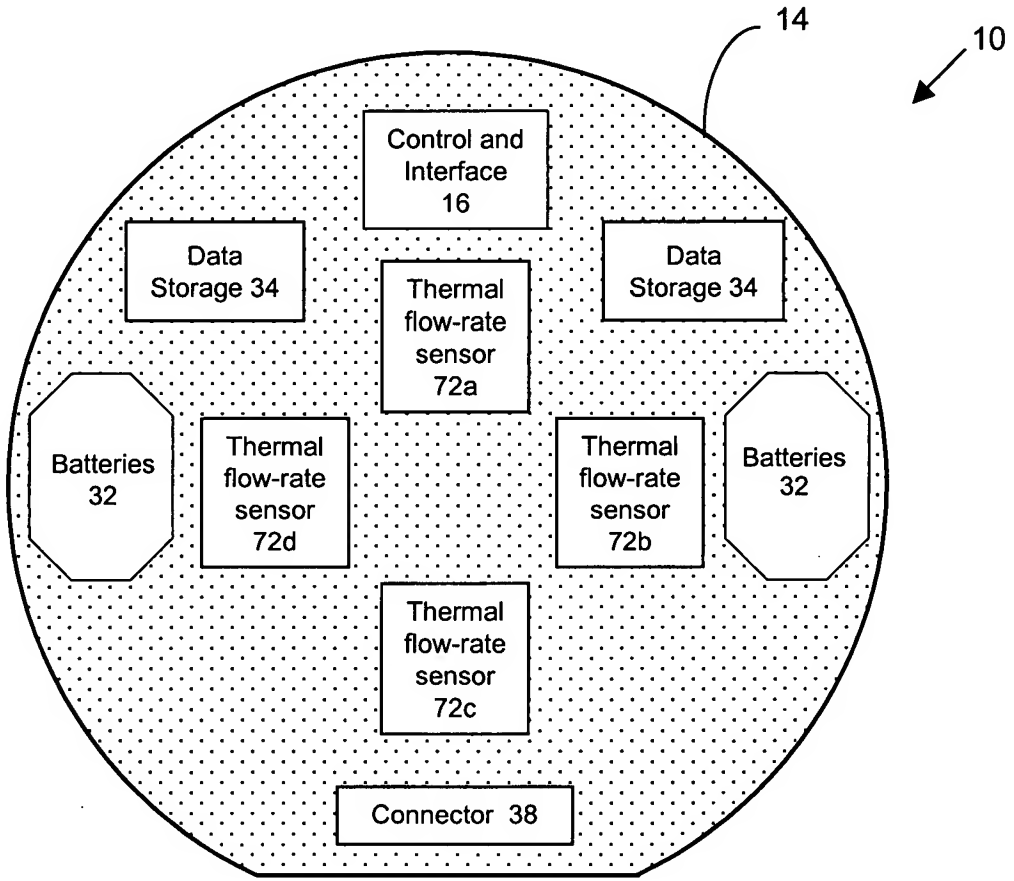

14
10
Control and Interface 16
Data Storage 34
Data Storage 34
Thermal flow-rate sensor 72a
Batteries 32
Thermal flow-rate sensor 72d
Thermal flow-rate sensor 72b
Batteries 32
Thermal flow-rate sensor 72c
Connector 38

FIGURE 15B

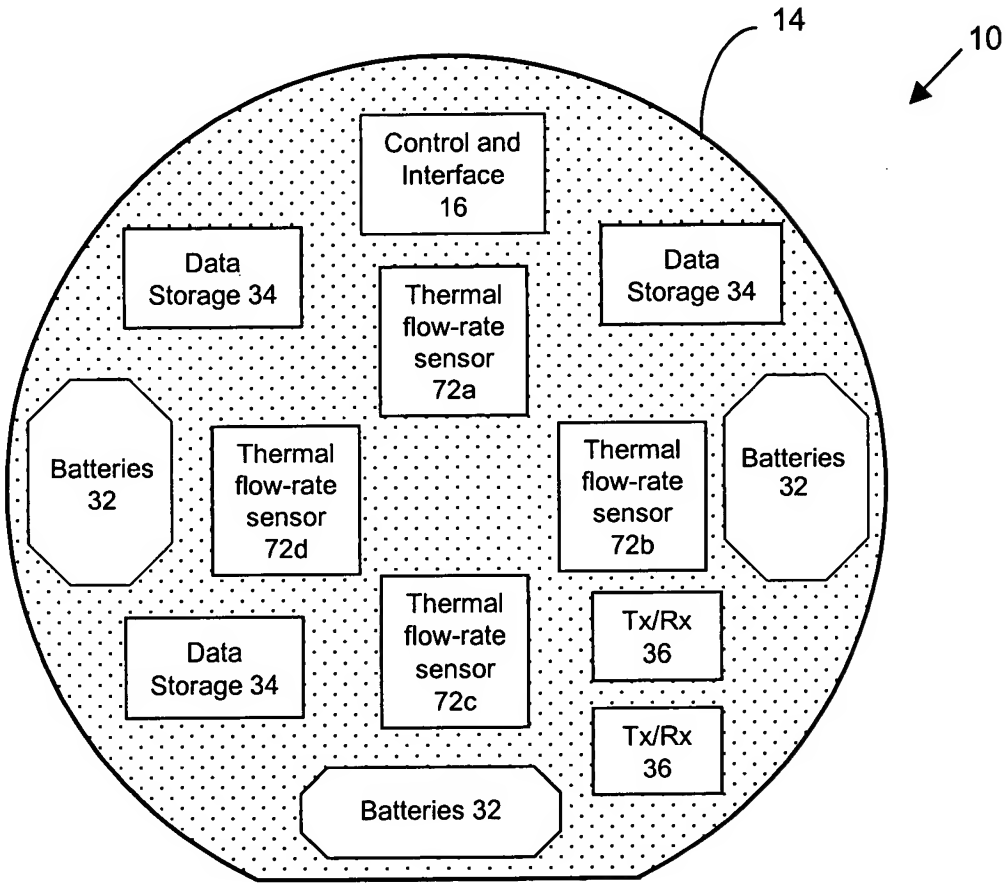

14
10
Control and Interface 16
Data Storage 34
Thermal flow-rate sensor 72a
Data Storage 34
Batteries 32
Thermal flow-rate sensor 72d
Thermal flow-rate sensor 72b
Batteries 32
Thermal flow-rate sensor 72c
Tx/Rx 36
Data Storage 34
Tx/Rx 36
Batteries 32

FIGURE 15C

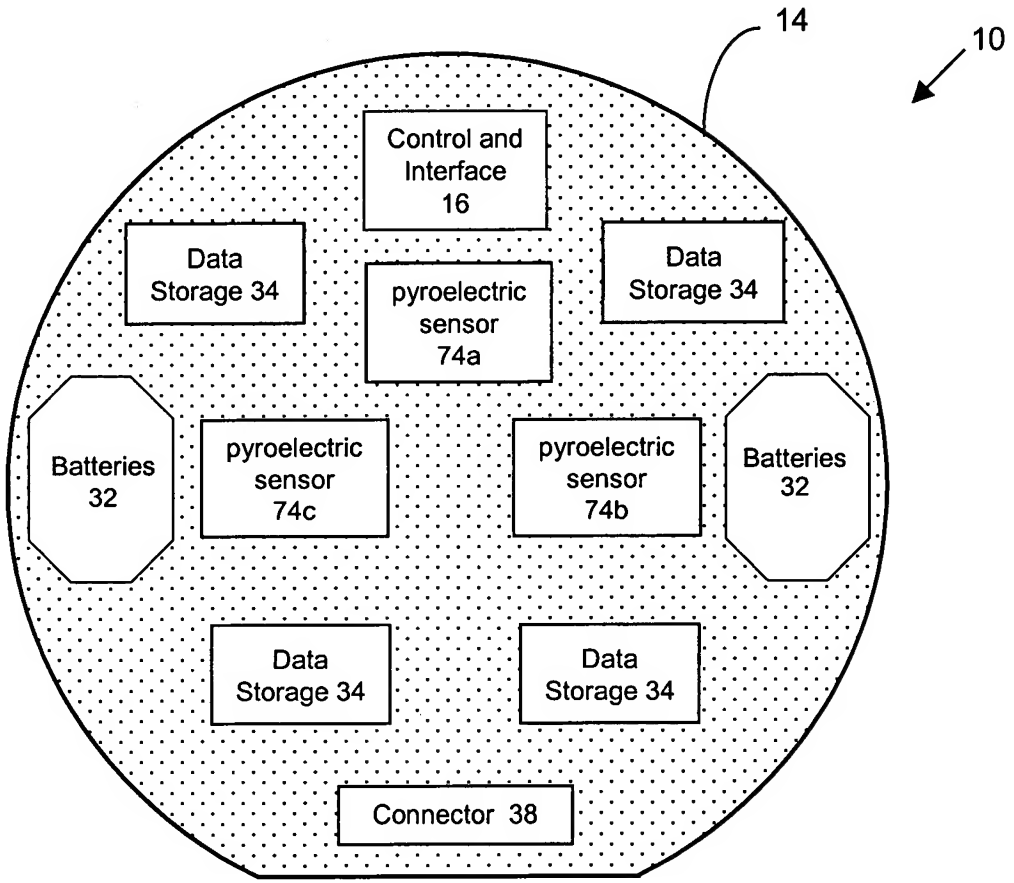

14
10
Control and Interface 16
Data Storage 34
pyroelectric sensor 74a
Data Storage 34
Batteries 32
pyroelectric sensor 74c
pyroelectric sensor 74b
Batteries 32
Data Storage 34
Data Storage 34
Connector 38

FIGURE 16

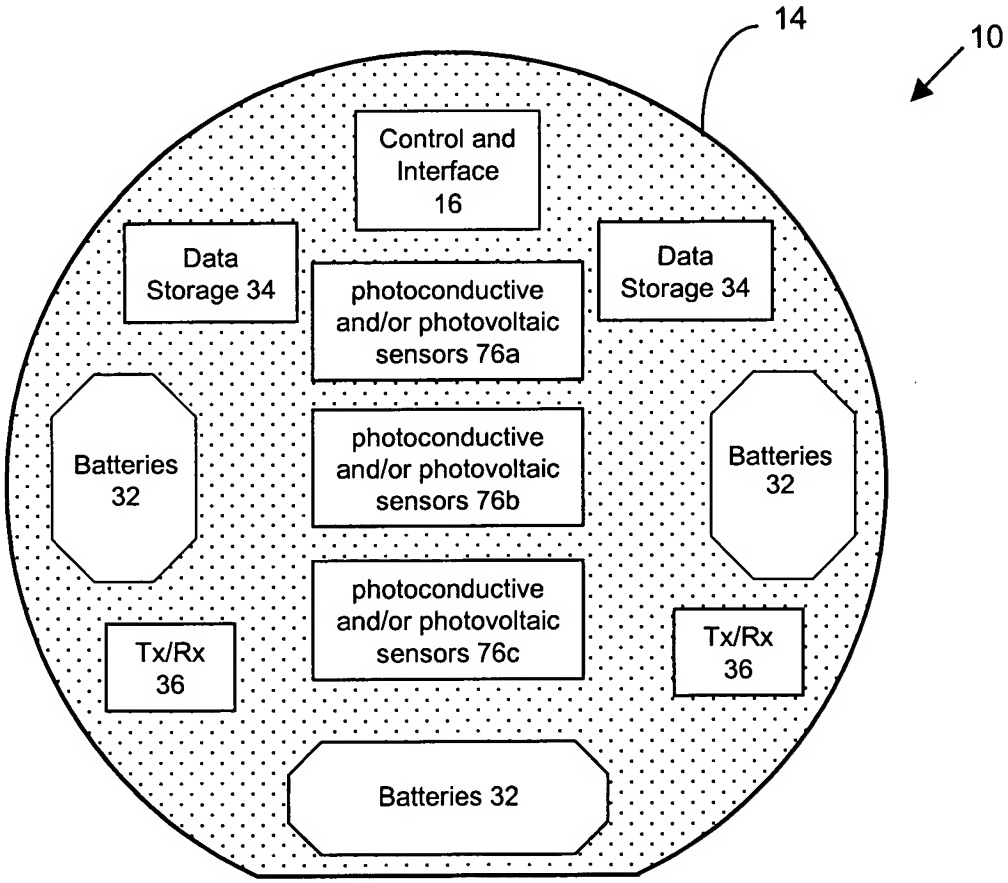

14
10
Control and Interface 16
Data Storage 34
Data Storage 34
photoconductive and/or photovoltaic sensors 76a
Batteries 32
photoconductive and/or photovoltaic sensors 76b
Batteries 32
photoconductive and/or photovoltaic sensors 76c
Tx/Rx 36
Tx/Rx 36
Batteries 32

FIGURE 17

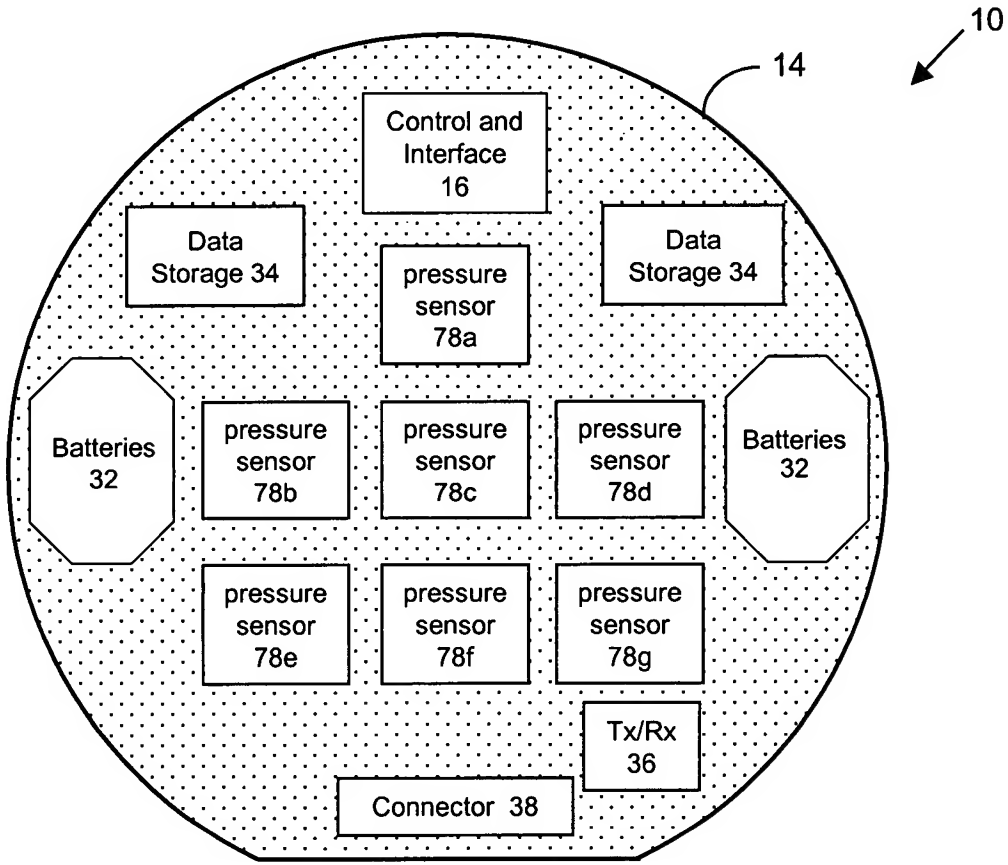

10
14
Control and Interface 16
Data Storage 34
pressure sensor 78a
Data Storage 34
Batteries 32
pressure sensor 78b
pressure sensor 78c
pressure sensor 78d
Batteries 32
pressure sensor 78e
pressure sensor 78f
pressure sensor 78g
Tx/Rx 36
Connector 38

FIGURE 18

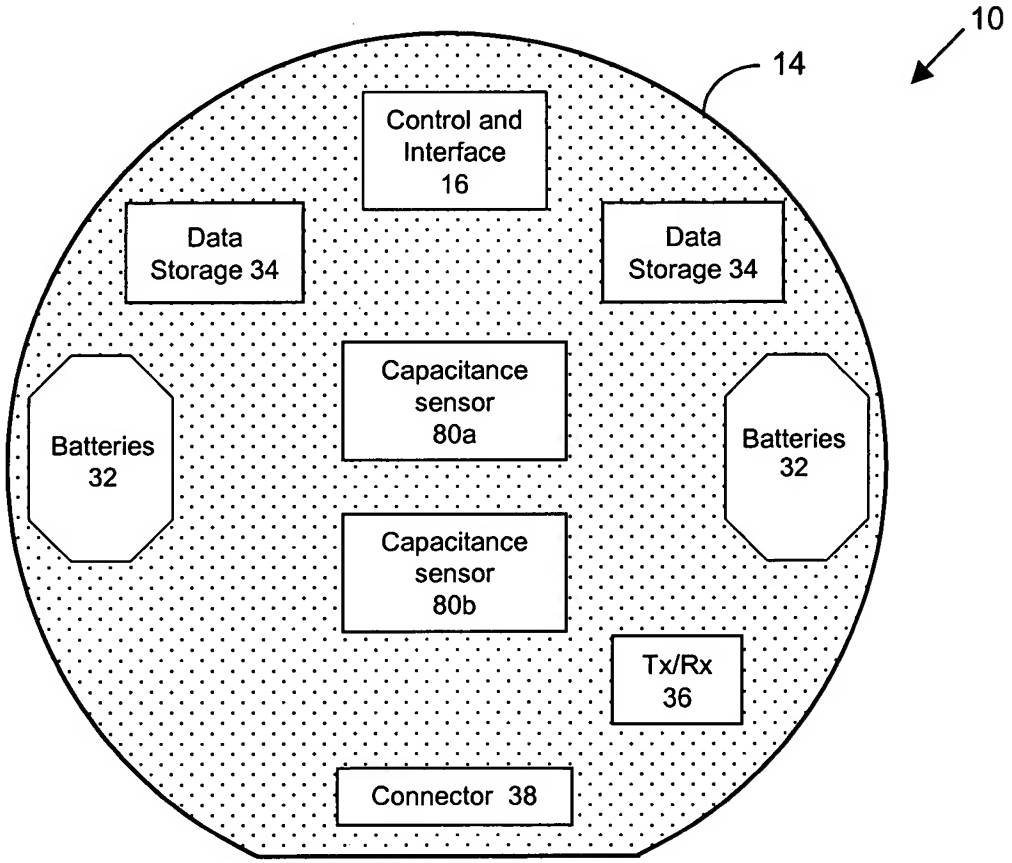

10
14
Control and Interface 16
Data Storage 34
Data Storage 34
Capacitance sensor 80a
Batteries 32
Batteries 32
Capacitance sensor 80b
Tx/Rx 36
Connector 38

FIGURE 19

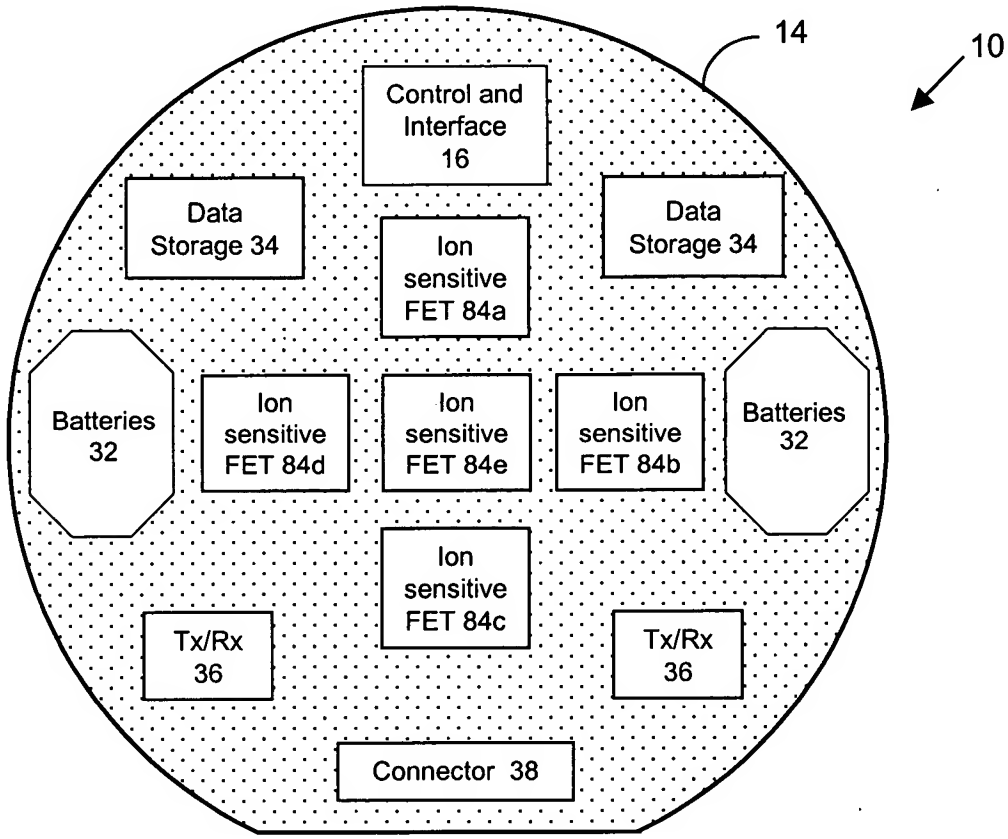
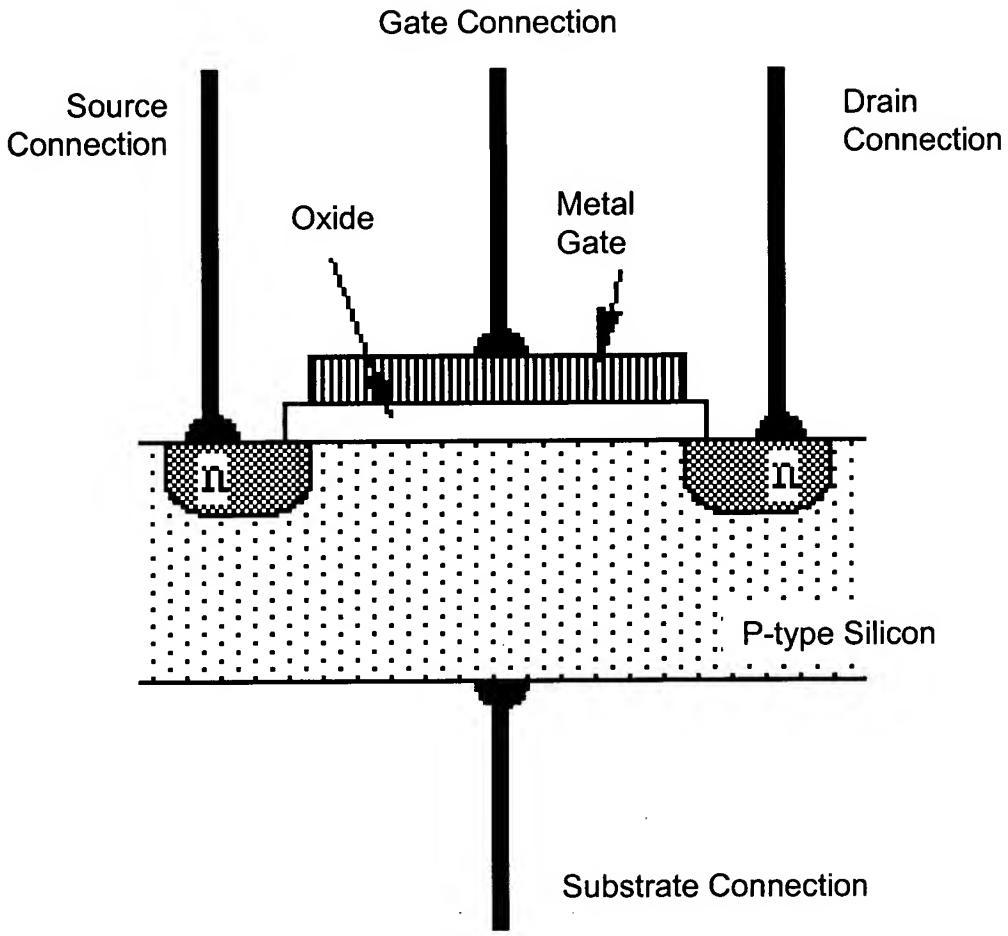

14
10
Control and Interface 16
Data Storage 34
Ion sensitive FET 84a
Data Storage 34
Batteries 32
Ion sensitive FET 84d
Ion sensitive FET 84e
Ion sensitive FET 84b
Batteries 32
Ion sensitive FET 84c
Tx/Rx 36
Tx/Rx 36
Connector 38

FIGURE 20

FIGURE 21


Gate Connection
Source Connection
Drain Connection
Oxide
Metal Gate
n
n
P-type Silicon
Substrate Connection

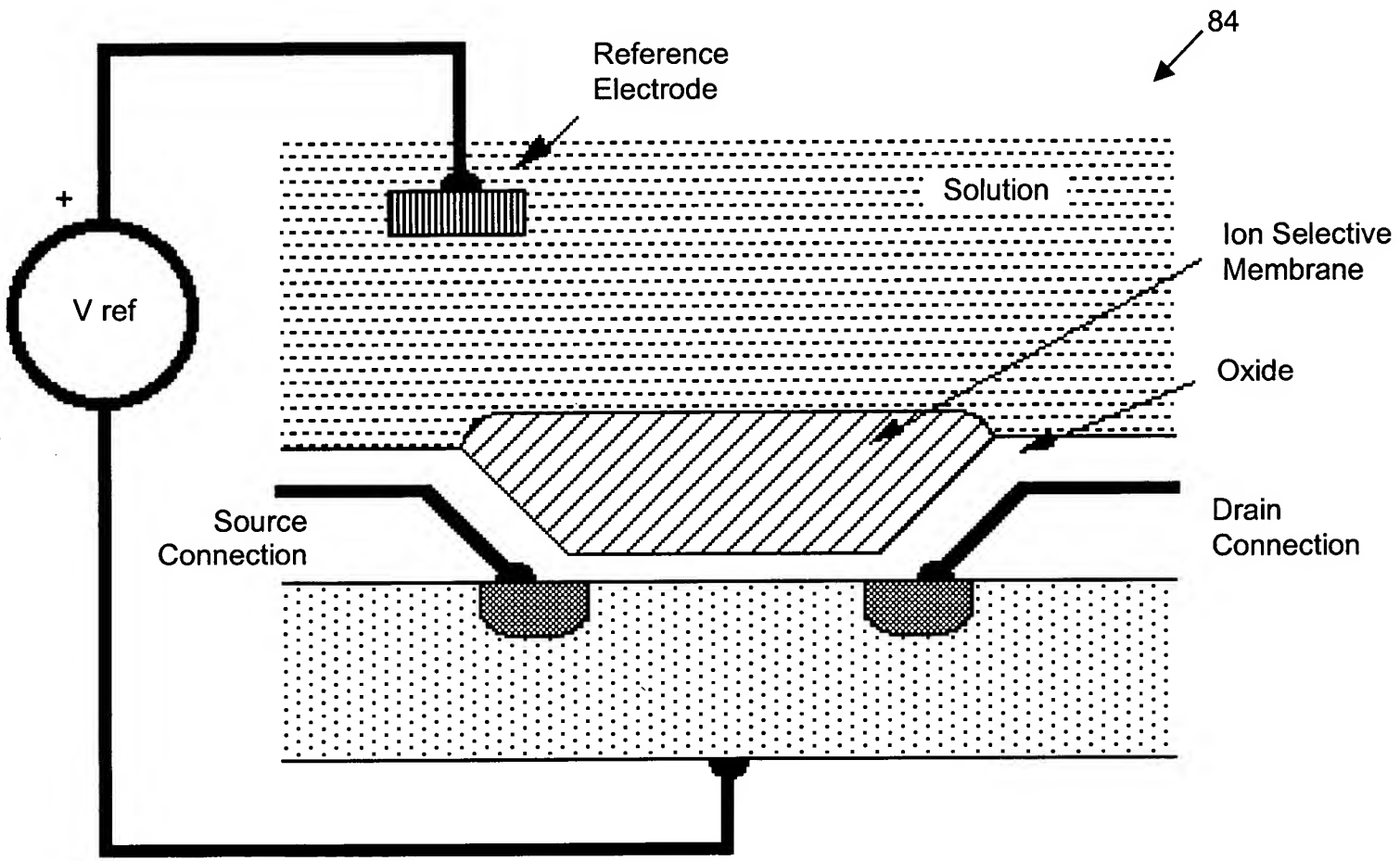

84
Reference
Electrode
Solution
Ion Selective
Membrane
Oxide
+
V ref
Source
Connection
Drain
Connection

FIGURE 22

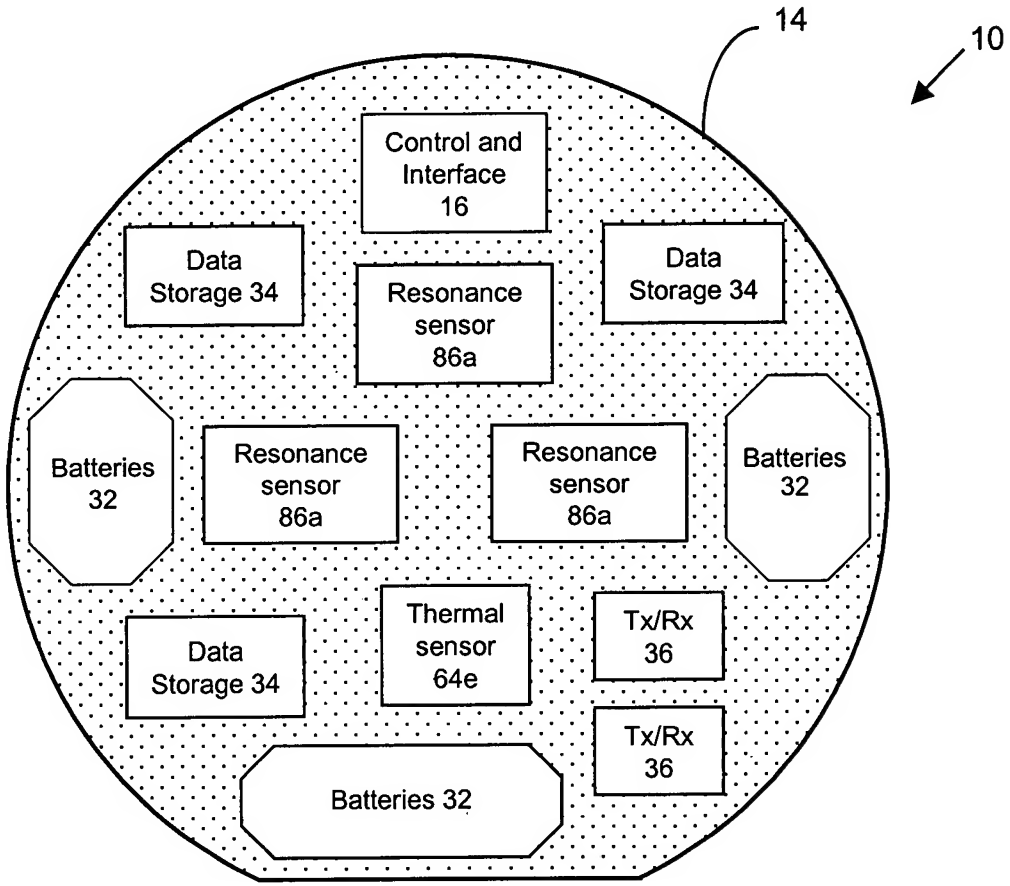

14
10
Control and Interface 16
Data Storage 34
Resonance sensor 86a
Data Storage 34
Batteries 32
Resonance sensor 86a
Resonance sensor 86a
Batteries 32
Data Storage 34
Thermal sensor 64e
Tx/Rx 36
Tx/Rx 36
Batteries 32

FIGURE 23

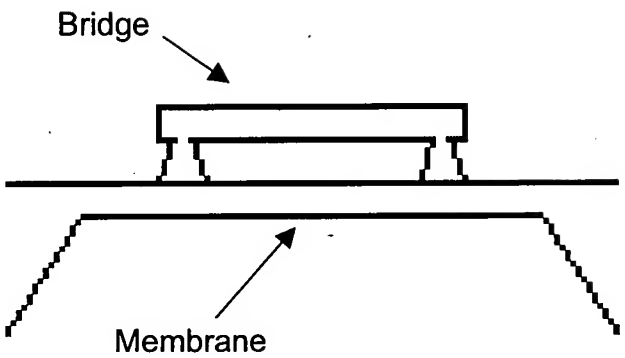


FIGURE 24A

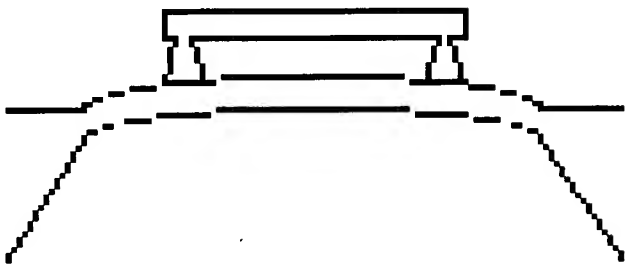


FIGURE 24B

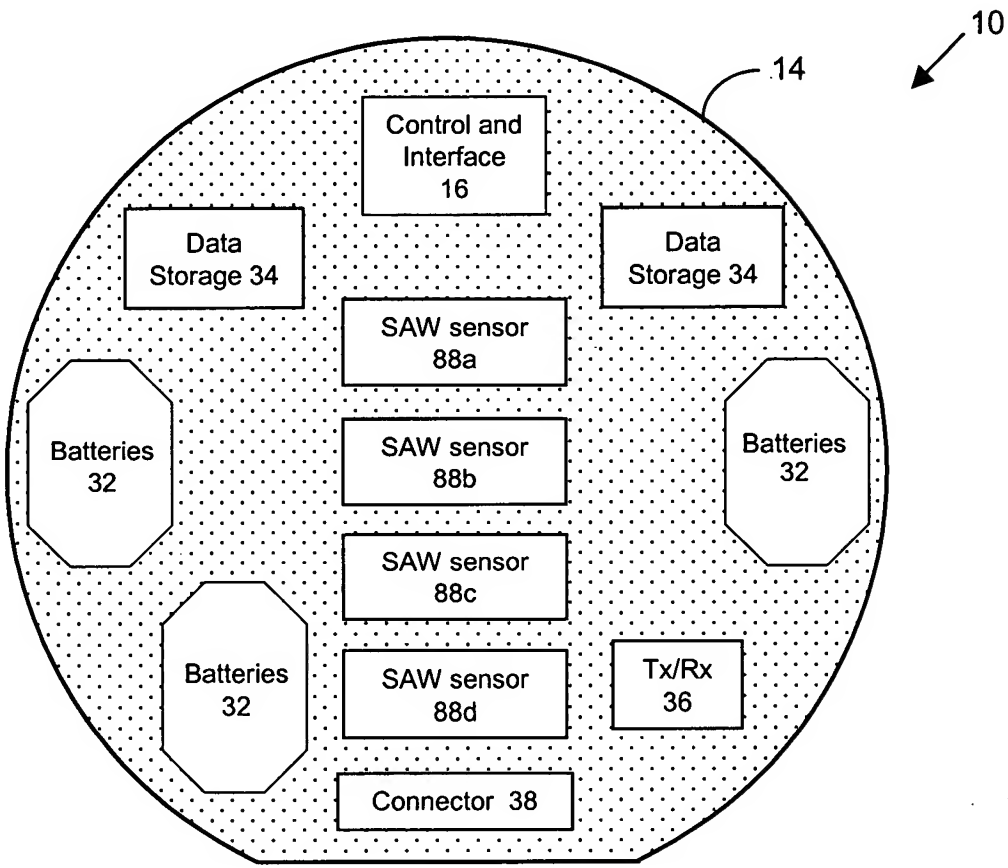

10
14
Control and Interface 16
Data Storage 34
Data Storage 34
SAW sensor 88a
SAW sensor 88b
SAW sensor 88c
SAW sensor 88d
Batteries 32
Batteries 32
Batteries 32
Tx/Rx 36
Connector 38

FIGURE 25